

## Murrow, Patricia

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**From:** Matt Thelen <matt.thelen@wellmandynamics.com>  
**Sent:** Tuesday, July 02, 2019 12:55 PM  
**To:** Murrow, Patricia  
**Cc:** Matt Thelen  
**Subject:** RE: WDC Acquisition LLC, Creston, IA (Wellman) - Request for Groundwater Sampling Results (IDPH)  
**Attachments:** 2nd Semi annual RAD Report 2018.pdf; 6-20-19 IDPH Inspection Report.pdf

Hello Pat,

The results are compiled into a semiannual report, but not forwarded to IDPH. Rather, the results and reports are reviewed during IDPH inspections. The reports compare the analytical data against calculated concentrations of concern. In the event the results would show the need for further evaluation, it would be reported to IDPH immediately.

For your reference, I've attached the latest semiannual report with groundwater evaluation and the latest IDPH inspection report letter, which was conducted just a few weeks ago.

If you have any questions regarding this information, please let me know.

Thanks,

Matt Thelen  
Environmental Engineer  
WDC Acquisition LLC  
1746 Commerce Road  
Creston, Ia 50801  
Phone: 641-782-0283  
Email: [matt.thelen@wellmandynamics.com](mailto:matt.thelen@wellmandynamics.com)

RCRA



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**From:** Murrow, Patricia <Murrow.Patricia@epa.gov>  
**Sent:** Tuesday, July 02, 2019 10:01 AM  
**To:** Matt Thelen <matt.thelen@wellmandynamics.com>  
**Subject:** RE: WDC Acquisition LLC, Creston, IA (Wellman) - Request for Groundwater Sampling Results (IDPH)

Matt,  
Thank you for the results!  
One more request.  
Do you receive any correspondence back from IDPH pertaining to the results? Acceptability, within permit limits, etc. and/or comments? If so, could I also get a copy of that correspondence?

Thanks.  
Pat

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**From:** Matt Thelen <[matt.thelen@wellmandynamics.com](mailto:matt.thelen@wellmandynamics.com)>  
**Sent:** Tuesday, July 02, 2019 9:42 AM  
**To:** Murrow, Patricia <[Murrow.Patricia@epa.gov](mailto:Murrow.Patricia@epa.gov)>  
**Cc:** Matt Thelen <[matt.thelen@wellmandynamics.com](mailto:matt.thelen@wellmandynamics.com)>  
**Subject:** RE: WDC Acquisition LLC, Creston, IA (Wellman) - Request for Groundwater Sampling Results (IDPH)

Hello Pat,

I've attached 2015-2018 groundwater results from samples collected as part of the IDPH monitoring. The samples are collected annually in the fall.

Also, I received the Interim RFI Report approval letter, thank you. We will plan on implementing the additional RCRA well monitoring beginning with this fall's sampling event (Sept. 2019).

Please let me know if you have any questions or require additional information.

Thanks,

Matt Thelen  
Environmental Engineer  
WDC Acquisition LLC  
1746 Commerce Road  
Creston, Ia 50801  
Phone: 641-782-0283  
Email: [matt.thelen@wellmandynamics.com](mailto:matt.thelen@wellmandynamics.com)

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**From:** Murrow, Patricia <[Murrow.Patricia@epa.gov](mailto:Murrow.Patricia@epa.gov)>  
**Sent:** Tuesday, July 02, 2019 8:53 AM  
**To:** Matt Thelen <[matt.thelen@wellmandynamics.com](mailto:matt.thelen@wellmandynamics.com)>  
**Subject:** WDC Acquisition LLC, Creston, IA (Wellman) - Request for Groundwater Sampling Results (IDPH)



Hello Matt,

I have a request for you.

Could you send me the last few years/rounds of sampling results for groundwater samples that were collected, analyzed and reported to IDPH?

I know we have talked about the groundwater sampling and in general terms the results, even discussed this briefly at the last meeting. I may have received copies of previous results, but I don't recall anything recently.

I would appreciate receiving copies of the results and/or the groundwater reports associated with this sampling. If this information is available in electronic format and not too large, could you try emailing it to me?

If you have questions about this request and/or would like to discuss, please let me know.

Thanks.

Pat

Patricia Murrow  
US Environmental Protection Agency, Region 7  
11201 Renner Boulevard  
Lenexa, KS 66219  
(913) 551-7627 (office)  
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**Iowa Department of Public Health**  
Protecting and Improving the Health of Iowans

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Gerd W. Clabaugh, MPA  
Director

Kim Reynolds  
Governor

Adam Gregg  
Lt. Governor

June 21, 2019

James Mahoney, President & CEO  
WDC Acquisition LLC  
d/b/a/ Wellman Dynamics  
1746 Commerce Road  
Creston, IA 50801

License No.: 0103-1-88-SM1

Dear Mr. Mahoney:

This refers to the unannounced routine health and safety inspection conducted by this office on June 20, 2019, of activities authorized by the State of Iowa under Radioactive Materials License No. 0103-1-88-SM1. The results of this inspection were discussed with Matt Thelen at the conclusion of the inspection.

The inspection was an examination of activities conducted under your license as they relate to radiation safety, to compliance with the Iowa Department of Public Health (Agency) Rules, and with the conditions of your license. The inspection consisted of a selective examination of procedures and representative records, observations, independent measurements, and interviews with licensee personnel.

No violations of Agency requirements were identified during the course of this inspection. Therefore, this inspection is considered closed.

If you have any questions concerning this matter please do not hesitate to contact Stuart R. Jordan at 515-281-0403, Derek D. Elling at 515-380-8752 or me.

Sincerely,

Randal S. Dahlin  
Bureau of Radiological Health  
(515) 281-0419  
[randal.dahlin@idph.iowa.gov](mailto:randal.dahlin@idph.iowa.gov)

RSD/rd

cc: Matt Thelen, RSO

DDE

**Second Semiannual  
Radioactive Material License Compliance Review  
September 2018**

WDC Acquisition, LLC Facility  
Creston, Iowa

Prepared For:

**WDC Acquisition, LLC  
1746 Commerce Road  
Creston, Iowa 50801**

**4000:PA007799  
January 2019**

Prepared By:

**Penn Environmental & Remediation, Inc.**  
111 Ryan Court, Lower Level  
Pittsburgh, PA 15205



**Penn E&R**  
Environmental & Remediation, Inc.

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**SECOND SEMIANNUAL  
RADIOACTIVE MATERIAL LICENSE COMPLIANCE REVIEW REPORT  
SEPTEMBER 2018  
WDC ACQUISITION, LLC FACILITY  
CRESTON, IOWA**

**1.0 INTRODUCTION**

Penn Environmental & Remediation, Inc. (Penn E&R) conducted the second 2018 semiannual compliance review of the WDC Acquisition, LLC (WDC) facility located in Creston, Iowa on September 26 and 27, 2018. The purpose of the review was to evaluate compliance with the Iowa Department of Public Health (IDPH) License No. 0103-1-88-SM1 (as renewed effective June 3, 2014) to possess and use source materials. Activities included the following:

- Review of current license and conditions;
- Interviews with key personnel involved in the use and management of radioactive materials at the facility;
- Physical inspection of plant facilities and operations;
- Completion of ambient radiation survey; and
- Sampling and analysis of surface smear samples, air samples, and leachate samples.

These activities are summarized in this report.

Since 2006, at the direction of the Radiation Safety Officer (RSO), a more detailed compliance review report has typically been submitted for the second semiannual compliance review. The compliance reviews are performed to satisfy the requirements of Section 8.2 of the WDC Radiation Safety Program (WRSP) dated May 2014. Compliance with the WRSP is a condition of WDC's radioactive material license.

## 2.0 BACKGROUND

The WDC facility produces specialty lightweight castings, primarily for the aerospace industry. These castings are made from aluminum and a variety of magnesium alloys. Some of the magnesium alloys utilize thorium as an alloying agent. Thorium is regulated as a “source material,” under the Atomic Energy Act. As a result, the facility is required to have a nuclear materials license issued by the IDPH under agreement between the State of Iowa and the U.S. Nuclear Regulatory Commission.

A Site Location Map is provided as **Figure 1**. **Figure 2** is a Survey Map. **Figure 3** is a Well Location Map. Those portions of the facility subject to the license consist of the following:

- Main Plant Building containing the manufacturing operations, offices, and Shipping Department;
- Warehouse Building containing the Pattern Shop, Pattern Storage, Warehouse, and Receiving Department;
- Thorium Storage Building containing thorium alloy agents, thoriated residuals, and melt vessels for thorium alloy production; and
- Chip/Dross Building potentially containing additional thoriated residuals.

### 2.1 Radioactive Materials License

WDC operates under a radioactive materials license issued by the IDPH. The current license was issued by IDPH on June 3, 2014 and will expire on July 1, 2019. Amendment requests to this license may be made at any time, accompanied by the appropriate fee. Termination of the license should be requested if activities involving radioactive materials are permanently discontinued prior to the license expiration date. A permit renewal application with the proper fee or a termination request should be submitted at least 30 days prior to the license expiration date or June 1, 2019.

### 2.2 Compliance Review Scope

In order to perform the compliance review, the current license, application documents, and the WRSP, dated May 2014, were reviewed in detail. Specific requirements contained in these documents were identified and are presented in **Table 1**, Compliance Review Items. These items are numbered sequentially to simplify the process of identifying the requirements. References to the appropriate source documents are also provided.

### 3.0 COMPLIANCE REVIEW

Each of the sequentially numbered compliance review items, consistent with **Table 1**, is addressed in this section.

#### Item 1: General Information (License and Application)

Radioactive material information, authorized use, and license conditions specified in the May 2014 permit renewal application remain as noted in the application and in the June 2014 permit. In 2018, the company name changed from Wellman Dynamics Corporation to WDC Acquisition, LLC. WDC informed IDPH of the name change in the second half of 2018. Mr. Matt Thelen continues to function on behalf of WDC as both site contact and as RSO.

Notes:

- Groundwater sampling, analytical, and reporting requirements for radiological constituents as noted in Section 10.0 of the May 2014 WRSP were completed for 2018 as required. Additional information is provided in **Appendix B**.

#### Item 2: WRSP Section 2.1.1 – RSC Authorities and Duties

Radiation Safety Committee (RSC) duties remain as specified. Duties listed continue to be performed by RSC members. The September 2018 compliance review documented by this report constitutes the most current review of the WRSP. Radiation safety training was originally performed by a Certified Health Physicist and videotaped at the facility for future use on September 7, 2005. The training video is to be presented annually to the appropriate employees (those with a possible exposure greater than 100 mrem in a year) and supplemented as needed by plant personnel. The training is designed to address the requirements of the WRSP, Section 5.0. The Radiation Safety Procedure for Personnel Exposure Monitoring was finalized in accordance with the WRSP effective October 31, 2005 and continues to be implemented, as directed by the RSO. Records are maintained by the RSC, including training documentation, survey and exposure records, meeting attendance and content, thorium inventory records, and radiation safety and handling procedures.

Annual training and personnel exposure monitoring have been suspended by the RSO since 2015 due to limited thoriated material usage. During 2014, the highest calculated employee exposure was 1.99 mrem for the year, significantly below the 100 mrem/year threshold.

#### Item 3: WRSP Section 2.1.3 – RSC Meetings

The last documented RSC meeting took place on September 12, 2018.

#### Item 4: WRSP Section 2.2.2 – RSO

Mr. Matt Thelen is the RSO for WDC, effective October 7, 2009.



Item 5: WRSP Section 2.2.4 – RSO Duties and Responsibilities

RSO duties remain as specified. Duties listed continue to be performed by the RSO or his designee. Radioactive material management continues to be documented and tracked for license compliance, proper storage, and disposal planning.

Annual training and personnel exposure monitoring have been suspended by the RSO since 2015 due to limited thoriated material usage. During 2014, the highest calculated employee exposure was 1.99 mrem for the year, significantly below the 100 mrem/year threshold for training and the 500 mrem/year threshold for monitoring.

Item 6: WRSP Section 3.0 – Radioactive Material Management

The only areas that qualify as restricted areas ( $> 0.002$  rem/hr), per WDC designation, are the Thorium Building and the Chip/Dross Building. The only areas that occasionally may qualify as radiation areas ( $> 0.005$  rem/hr), per Iowa Regulation 641-38.2, are also the Thorium Building and the Chip/Dross Building. Both the Thorium Building and the Chip Building are marked as required. Containers with radioactive materials are typically painted magenta and labeled appropriately as radioactive material per facility convention, as noted.

Item 7: WRSP Section 3.2.1 – Metallic Scrap

Thoriated ingots re-melted from scrap are now stored for future use in metal bins in the Thorium Building and the Chip/Dross Building, as opposed to Metal Storage. Eight (8) bins total were observed, seven (7) in the Chip/Dross Building and one (1) in the Thorium Building. Twelve (12) drums identified as thoriated scrap are stored in the two buildings as noted on the current inventory.

Item 8: WRSP Section 3.2.2 – Thoriated Dross

The majority of the thoriated dross materials are stored in the Thorium Building. Thoriated dross materials are no longer typically stored in the Chip/Dross Building, per previous recommendation. The number and identification of the thoriated dross material drums is tracked by WDC through the inventory. The drums are properly identified and the material is segregated from other residuals.

Item 9: WRSP Section 3.2.3 – Other Residuals

Satellite storage of thoriated residuals follows the stated protocol. Due to the limited production of thoriated castings, there is currently no satellite accumulation of thoriated residuals in the facility. Drums are managed and inventoried by WDC as described in the WRSP. No residuals or other thoriated waste material have been disposed of site in the past 12 months.

Residual materials in the scrap area located to the south of the Chip Building have been relocated to the Chip/Dross Building, per previous recommendation. These materials have been consolidated, packaged, and properly identified.

Item 10: WRSP Section 3.2.4 – Raw Materials

Raw material drums are typically stored in the Thorium Building, Metal Storage, or in the Melt Shop as stated in the WRSP. The remaining raw material (7 pounds) at the facility is currently contained in a raw material drum stored in the Thorium Building.

Item 11: WRSP Section 3.2.5 – Work In Progress

Per WDC, no work-in-progress parts are present and none were observed.

Item 12: WRSP Section 3.2.5.1. - Welding Operations

Welding of thoriated parts was not observed. After the August 2015 review, WDC removed the thoriated welding rods from the welding area for storage with the thoriated rods already in the Thorium Building.

Item 13: WRSP Section 3.2.5.2 – Storage of Castings Pending Shipment

Thoriated parts were not observed in Shipping.

Item 14: WRSP Section 3.2.5.3 – Shipping of Thoriated Castings

Protocols are in place for proper shipping practices.

Item 15: WRSP Section 3.3.1 – Thorium Building

Thorium Building storage practices were observed as described in the WRSP. Thoriated material containers stored in the Chip/Dross Building were labeled per license requirements.

Item 16: WRSP Section 3.3.2 – Warehouse

Thoriated parts are no longer stored in the Warehouse.

Item 17: WRSP Section 3.3.3 – Main Plant

Raw material storage was not observed in the Main Plant. Satellite accumulation drums were not observed in Main Plant. The Thorium Grinding Area has been relocated from Rotary File to Machine Trim.

Drawers containing thoriated check standards in the Melt Shop Lab were properly labeled. Thoriated test bars have been removed from racks near Shipping and Heat Treatment. Heat Treatment test bar racks are no longer labeled for possible radioactive material storage.

Item 18: WRSP Section 4.2 – Usage/Users of Licensed Materials

Uses have not changed from those designated by permit application documents and the WRSP. Mr. Matt Thelen is the RSO for WDC.

Item 19: WRSP Section 4.3 – Review of the ALARA Program

The RSC review of the As Low as Reasonably-Achievable (ALARA) Program took place on September 12, 2018.

Item 20: WRSP Section 4.4 – RSO Commitment to ALARA

Responsibility for the ALARA program resides with the RSO. The ALARA Program was reviewed during the RSC meeting on September 12, 2018. The RSO will review instances of ALARA Program deviation.

Annual training and personnel exposure monitoring have been suspended by the RSO since 2015 due to limited thoriated material usage. During 2014, the highest calculated employee exposure was 1.99 mrem for the year, significantly below the 100 mrem/year threshold for training and the 500 mrem/year threshold for monitoring.

Item 21: WRSP Section 4.5 – Authorized Users

Mr. Matt Thelen is the RSO for WDC.

Item 22: WRSP Section 4.6 – Monitoring External Radiation Doses

Dosimetry badges were observed in designated work areas (Thorium Building and Chip/Dross Building) per the Radiation Safety Procedure for Personnel Exposure Monitoring. The badges at the Melt Shop Desk and in Thorium Grinding and the Saw Room have been removed per the RSO in favor of personal dosimetry. The Thorium Grinding Area has been relocated from Rotary File to Machine Trim.

Annual training and personnel exposure monitoring have been suspended by the RSO since 2015 due to limited thoriated material usage. During 2014, the highest calculated employee exposure was 1.99 mrem for the year, significantly below the 100 mrem/year threshold for training and the 500 mrem/year threshold for monitoring.

Item 23: WRSP Section 4.7 – Designation of Restricted Areas

The Thorium Building and the Chip Building are designated and marked as restricted areas.

Item 24: WRSP Section 5.0 – Radiation Safety Training Program

Annual training and personnel exposure monitoring have been suspended by the RSO since 2015 due to limited thoriated material usage. During 2014, the highest calculated employee exposure was 1.99 mrem for the year, significantly below the 100 mrem/year threshold for training and the 500 mrem/year threshold for monitoring.

Item 25: WRSP Section 6.0 – Personnel Exposure Monitoring Program

The Radiation Safety Procedure for Personnel Exposure Monitoring has been finalized in accordance with the WRSP and is being implemented, as directed by the RSO. Annual training and personnel exposure monitoring have been suspended by the RSO since 2015 due to limited thoriated material usage. During 2014, the highest calculated employee exposure was 1.99 mrem for the year, significantly below the 100 mrem/year threshold for training and the 500 mrem/year threshold for monitoring.

Item 26: WRSP Section 7.0 - Survey Operations

Regularly scheduled surveys of the facility will be performed semiannually, per WDC personnel. In 2018, surveys were completed by Penn E&R on behalf of WDC in March and September and have been documented in the compliance review reports on file at WDC's facility. September survey results are presented in **Table 3**. Restricted area surveys of the Thorium Building and the Chip/Dross Building have been completed by WDC personnel, with gamma-radiation field strength values posted. Survey instruments present for inspection are in calibration (**Table 2**). Per the RSO, monitoring instruments are checked for proper performance before use.

Item 27: WRSP Section 8.0 - Audits and Appraisals

WDC has contracted with Penn E&R to complete semiannual compliance reviews regarding the terms and conditions of the Radiological Material License for the WDC facility. At WDC's direction, a report describing the results of each semiannual compliance review will be provided to WDC for its use and record. Evaluations of the compliance reviews will be completed by the RSO or designee for presentation to the RSC at the annual meeting or as conditions merit. The RSC will evaluate the performance of the RSO at the annual meeting and act as appropriate to rectify issues as they arise. No modifications to the WRSP are anticipated at this time.

Item 28: WRSP Section 9.0 - Corrective Actions

No incident reports have been required or documented. No corrective actions are anticipated at this time other than resolution of the miscellaneous deficiencies identified within this compliance review report.

Item 29: License Application Attachment C – Facility and Equipment

The facility and equipment descriptions remain current.

## 4.0 SITE RADIATION SURVEY

### 4.1 Surface Sampling

During the September 2018 compliance review, the facility was surveyed for ambient gamma radiation and gross alpha removable surface radioactivity. Ambient gamma radiation was measured using a Ludlum Model 19  $\mu\text{R}$  Meter which is a gamma scintillation detector that can be used to accurately measure very low levels of radiation field strength. The ambient gamma radiation survey was conducted following the path shown in **Figure 2**, Survey Map.

The results of the ambient gamma radiation survey are presented in **Table 3**, Radioactivity Survey Results. The background ambient gamma radiation level in the parking lot south of the plant was 8 microRoentgens per hour ( $\mu\text{R/hr}$ ). The ambient gamma radiation levels for common areas in and around the facility ranged between 5 and 195 (outside Chip/Dross Building) with an average of 10.8, a median of 8, and a standard deviation of 22.1. Specific locations showing elevated  $\mu\text{R/hr}$  readings are also shown in **Table 3**. These locations corresponded to parts or materials that contained thorium.

The gross alpha removable surface radioactivity was measured by wiping a surface area of approximately 100 square centimeters with a wipe (smear sample) and submitting the smear samples to a laboratory [Pace Analytical (Pace)] for counting the removable radioactivity. For the gross alpha removable surface radioactivity sampling, ten (10) smear samples were taken throughout the plant as noted in **Figure 2**. The locations for smear samples were selected based on a bias toward areas of most-likely contamination considering the processing of thorium material within the facility. These locations were also consistent with past audit locations.

A summary of the results of the gross alpha removable surface radioactivity survey (converted from pCi/Filter to dpm, as necessary) is presented in **Table 4**. The analytical reports for these smear samples are provided in **Appendix A**. All ten (10) smear sampling locations demonstrated gross alpha results below the minimum detectable activity (MDA). All ten (10) samples were also below the acceptable surface contamination levels for removable radioactivity (20 dpm), as specified in U.S. Atomic Energy Commission Regulatory Guide 1.86.

### 4.2 Air Sampling

Air particulate samples were collected during the September 2018 compliance review and analyzed for gross alpha radioactivity and thorium isotopes Th-232, Th-230, and Th-228. Sampling locations were designated as AS-1 through AS-3 and are shown in **Figure 2**. These locations were selected based on known areas of the facility used for processing thorium materials. Penn E&R placed an Allegro Industries rotary vane sampling pump at each of the locations. Each pump utilized a 37-millimeter glass fiber filter as the sample media, housed in a two-piece polystyrene holder. The pumps were started and operated for a period of approximately 24 hours at an airflow rate of 25 liters per minute. Following the 24-hour period, the sample holders were removed and shipped to the laboratory (Pace) for analyses.

A summary of the results is presented in **Table 5**. The analytical reports for these air samples are provided in **Appendix A**. For all air samples, all parameters were at or below their respective derived air concentration calculated limits, as given in Title 10, Chapter 1, Code of Federal Regulations (CFR), Standards for Protection against Radiation.

### **4.3 Leachate Sampling**

One leachate sample was collected during this audit and analyzed for gross alpha and thorium isotopes Th-232, Th-230, and Th-228. Uranium isotopes were inadvertently omitted in the analyses. The sample was collected from the discharge of the leachate storage tank prior to discharge to the City of Creston Publicly Owned Treatment Works. The sample was submitted to the laboratory (Pace) for analyses.

A summary of the results is presented in **Table 6**. The analytical report for this water sample is provided in **Appendix A**. Results for the gross alpha and thorium isotopes were all below the release to sewer concentrations specified in Title 10, Chapter 1, CFR, Standards for Protection against Radiation.

## TABLES



**Table 1**  
**Compliance Review Items**  
**WDC Acquisition, LLC Facility**  
**Second Semiannual Inspection - 2018**

Item	Document Cross Reference <sup>(1)</sup>	Description of Item	Compliance	Compliance Notes
1	License + License App.	Verify general information.	Y	M. Thelen is RSO effective 10/7/2009.
2	WRSP 2.1.1	RSC Authorities and Duties	Y	
3	WRSP 2.1.3	RSC Meetings	Y	RSC Meeting 9/12/2018.
4	WRSP 2.2.2	RSO	Y	M. Thelen is RSO effective 10/7/2009.
5	WRSP 2.2.4	RSO Duties and Responsibilities	Y, as noted	Annual training and personnel exposure monitoring suspended due to limited material usage 2015 through 2018.
6	WRSP 3.0	Radioactive Material Management	Y	
7	WRSP 3.2.1	Metallic Scrap	Y	
8	WRSP 3.2.2	Thoriated Dross	Y	
9	WRSP 3.2.3	Other Residuals	Y, as noted	Plates in foundry with slightly elevated readings; remove when practicable.
10	WRSP 3.2.4	Raw Material	Y	
11	WRSP 3.2.5	Work-in-Progress	Y	
12	WRSP 3.2.5.1	Welding Operations	Y	
13	WRSP 3.2.5.2	Storage of Castings – Shipping	Y	
14	WRSP 3.2.5.3	Shipping of Thoriated Castings	Y	
15	WRSP 3.3.1	Thorium, Chip/Dross Buildings	Y	
16	WRSP 3.3.2	Warehouse	Y	
17	WRSP 3.3.3	Main Plant	Y	
18	WRSP 4.2	Usage/Users of Licensed Materials	Y	M. Thelen is RSO effective 10/7/2009.
19	WRSP 4.3	Review ALARA	Y	RSC Meeting 9/12/2018.
20	WRSP 4.4	RSO ALARA	Y, as noted	Annual training and personnel exposure monitoring suspended due to limited material usage 2015 through 2018.
21	WRSP 4.5	Authorized Users	Y	M. Thelen is RSO effective 10/7/2009.
22	WRSP 4.6	Monitoring External Rad. Doses	Y, as noted	Personnel exposure monitoring suspended; limited material usage 2015 through 2018.
23	WRSP 4.7	Designation of Restricted Areas	Y	
24	WRSP 5.0	Radiation Safety Training Program	Y, as noted	Annual training suspended due to limited material usage 2015 through 2018.
25	WRSP 6.0	Personnel Exposure Program	Y, as noted	Personnel exposure monitoring suspended due to limited material usage 2015 through 2018. Area badge remains in Thorium Building; area badge now placed in Chip/Dross Building as of early 2017; all others removed per RSO in lieu of personal badges, as determined necessary by RSO.
26	WRSP 7.0	Survey Operations	Y	
27	WRSP 8.0	Audits and Appraisals	Y	
28	WRSP 9.0	Corrective Actions	Y, as noted	Correct items as noted.
29	App. Att. C	Facility/Equipment	Y	

**Table 1**  
**Compliance Review Items**  
**WDC Acquisition, LLC Facility**  
**Second Semiannual Inspection - 2018**

<sup>(1)</sup>Coding for cross references:

*License* = WDC Radiological Materials License Number 0103-1-88-SM1; dated June 3, 2014;

*License App.* = WDC Radiological Materials License Application for Renewal, dated May 2014; and

*WRSP* = WDC Radiation Safety Program with Authorization, dated May 2014 (Attachment B of WDC Radiological Materials License Application for Renewal).

**Table 2**  
**Radiation Detection Instruments \***  
**WDC Acquisition, LLC Facility**  
**Second Semiannual Inspection - 2018**

Scaler/Meter	Location	Serial No.	Probe/Counter	Serial No.	Date of Last Calibration	Calibration Expires	Status
Ludlum Model 1000 Scaler	Laboratory	S/N 154245	Ludlum Model 43-10 alpha window-less counter	S/N PR157685	11/16/2017	11/16/2018	Calibrated
Victoreen Model 450B	Envir. Office	S/N 1502	---	---	5/22/2018	5/22/2019	Calibrated
Bicron Model Surveyor 2000	Envir. Office	S/N A696B	Bicron PGM pancake probe	S/N 31605/I538C	5/22/2018	5/22/2018	Calibrated
Cesium-137 Check Source	Envir. Office	Catalog No. N186002, S/N 31605	---	---	---	---	Confirmed - On-site
U-238 Check Source	Envir. Office	177-7/637 dpm, 7/30/86	---	---	---	---	Confirmed - On-site

\* Instruments associated with X-Ray Department are not listed.

**Table 3**  
**Radioactivity Survey Results**  
**WDC Acquisition, LLC Facility**  
**Second Semiannual Inspection - 2018**

Sample No.	Location	Gamma Radiation (μR/hr)	Notes
1	Office Area	10	
2a	X-Ray Room	6	
2b	X-Ray Units on Floor	7	
3a	Shipping – East	7	No test bars (no labels, ok).
3b	Shipping – West	10	001SM*; no parts on rack (no labels, ok).
4	Final Inspection (“Scrap” Castings)	9	
5	Final Inspection	10	No rad parts, removed to Thorium Building per WDC.
6a	Cleaning Room (Rotary File) – East	8	
6b	Cleaning Room (Rotary File)	10	002SM*
6c	Cleaning Room (Rotary File) – West	9	Rough Inspection now nearby.
7a	Thorium Grinding Area (Outside)	10	Thorium Grinding Booth moved to Machine Trim, see notes below.
7b	Thorium Grinding Area (Inside)	9	
7c	Women's Locker Room	12	003SM*
8a	Layout – East	NA	Locked, restricted access.
8b	Layout	NA	Locked, restricted access.
8c	Machine Shop/Layout - West	NA	Locked, restricted access.
9	West of Machine Shop	9	
10	Fixture Room	9	
11	Machine Trim	7	008SM*; Temporary Thorium Grinding Booth (area reading inside, drum of residuals removed); no thorium grinding residuals or satellite storage; area dosimetry badge and log book no longer present, changed to personal dosimetry per WDC.
12	Old Rough Inspection	7	Rough Inspection now near Cleaning Room; no thorium satellite storage.
13a	Knockout (Outside)	7	
13b	Knockout	6	007SM*
14	Old Knockout	7	
15a	Saw Room - Southwest	8	006SM*; area dosimetry badge and log book no longer present, changed to personal dosimetry per WDC.
15b	Saw Room - Northeast	6	
16	Aluminum Melt	8	
17a	Dry Sand Molding – South	10	
17b	Dry Sand Molding – North	9	
17c	Dry Sand Molding – East	7	Plate @ 110.
18	Green Sand Heavy Lift	6	
19a	Green Sand Molding	6	
19b	Green Sand Molding – North	7	Plates @ 75, 80.
20a	Parts Storage next to Laboratory	6	
20b	Laboratory – Storage	10	Check standards and test bars in drawer (48 closed, 290 max. open - drawer labeled).
21a	Melt Shop – Control Room	9	Reading taken upstairs in pulpit.
21b	Melt Shop	8	004SM* at door; no access permitted; no drum for thoriated dross observed; no thoriated raw material observed; area dosimetry badge and log book no longer present; changed to personal dosimetry per WDC.
21c	Melt Shop – Break Room	10	
21d	Melt Shop – Outside	8	
22a	Metal Storage – East	7	
22b	Metal Storage – West	8	005SM*; no thoriated scrap baskets present; area dosimetry badge and log book no longer present per WDC; no storage in area.
23	Computer Casting Center	6	
24a	Core Molding - West	8	
24b	Core Molding - East	8	Plate @ 75.
25a	Maintenance Shop	6	
25b	Maintenance Shop (Outside)	6	

**Table 3**  
**(Continued)**

Sample No.	Location	Gamma Radiation (μR/hr)	Notes
26a	Thorium Building – South	15	
26b	Thorium Building – East	17	
26c	Thorium Building – North	80	
26d	Thorium Building – West	2,000	Outside with door closed; outside with door open @ 2,150; inside @ 4,800 near drums; <b>building posted as Restricted Area with meter readings noted.</b>
27	Thorium Storage	4,800	146 full size waste drums and 1 half size waste drum (visible drums marked with magenta paint, labels and ID numbers); 1 half size drum raw material (labeled); 3 small boxes of thorium test bars (labeled); 3 thoriated parts (free, labeled); 3 boxes thoriated parts (labeled); 1 metal bin thorium remelt ingots (labeled); 1 open full size drum thoriated weld rods (labeled); <b>area dosimetry badge present, log book records in EHS office per WDC.</b>
28	Gas Bottle Storage	235	
29	Chip Shed	18	
30	Equipment Garage	24	
31a	Pattern Shop (Outside)	8	Plates @ 130.
31b	Pattern Shop – East	9	
31c	Pattern Shop – West	8	
31d	Pattern Shop – North	7	
32	Pattern Storage	7	
33a	Receiving and Warehouse (East)	11	Sand @ 95.
33b	Receiving and Warehouse (West)	7	Boxed thoriated parts have been moved to Thorium Building.
34a	Pattern and Record Storage (East)	8	
34b	Pattern and Record Storage (West)	6	No thoriated standards observed.
35a	Chip/Dross Building – North	13	Outside w/ door closed; area inside building @ 90; thoriated material storage area reorganized: 12 full size drums residual soils/scrap; 1 half size drum residual soils/scrap; 7 steel bins of remelted ingots; containers w/ magenta and labels; 3 steel hoppers w/residuals from south of building and contents of deteriorated drums; Chip/Dross Building now <b>posted as Restricted Area with exposure readings noted, area dosimetry badge present, log book records in EHS office per WDC.</b>
35b	Chip/Dross Building – East	17	
35c	Chip/Dross Building – South	70	Half scrap tank @ 150 max. plus misc. scrap containing thoriated residuals south of Chip/Dross Building has been relocated to Chip/Dross Building.
35d	Chip/Dross Building – West	195	
36a	Core Room – South	11	Sand @ 20.
36b	Core Room	5	
36c	Core Room – North	9	
37	Core Storage	11	
38	Stairs	9	
39	Engineering	8	
40	Rest Room	9	
41a	Men's Locker Room – West	7	010SM*
41b	Men's Locker Room – North	9	
42	Cafeteria	7	009SM*
43a	Welding Shop – North	5	
43b	Welding Shop – Rod Storage	5	Thorium rods removed to Thorium Building by WDC after Second 2015 review.
43c	Welding Shop – South	5	
44a	Heat Treat – East	5	
44b	Heat Treat – South	6	Test bar rack (rack labeled, no thoriated test bars found).
44c	Heat Treat – West	6	
45a	Sand Blast – East	8	Sand @ 11.
45b	Sand Blast – West	6	
46a	Zyglo – East	7	
46b	Zyglo – West	8	
47a	Pickling (West)	7	
47b	Pickling (East)	6	

SM\* - Indicates that a smear sample was collected. Please see Table 4 for results.

**Table 4**  
**Smear Sampling Radioactivity Results**  
**WDC Acquisition, LLC Facility**  
**Second Semiannual Inspection - 2018**

<b>Sample/ Parameter</b>	<b>Result (dpm/100cm<sup>2</sup>)</b>	<b>Detection Limit (dpm/100cm<sup>2</sup>)</b>
001 Gross Alpha	-1.878 +/- 1.949	6.127
002 Gross Alpha	-1.128 +/- 2.209	6.127
003 Gross Alpha	-1.878 +/- 1.949	6.127
004 Gross Alpha	-2.264 +/- 1.805	6.127
005 Gross Alpha	-1.128 +/- 2.209	6.127
006 Gross Alpha	-1.878 +/- 1.949	6.127
007 Gross Alpha	-1.878 +/- 1.949	6.127
008 Gross Alpha	-1.128 +/- 2.209	6.127
009 Gross Alpha	-1.128 +/- 2.209	6.127
010 Gross Alpha	-2.264 +/- 1.805	6.127

Note:

Acceptable surface contamination equals 20 dpm/100 cm<sup>2</sup>  
per U.S. Atomic Energy Commission Reg. Guide 1.86.

**Table 5**  
**Air Sampling Radioactivity Results**  
**WDC Acquisition, LLC Facility**  
**Second Semiannual Inspection - 2018**

Parameter	Result (pCi/l)	Detection Limit (pCi/l)
<i>AS-1 - Green Sand Molding</i>		
Gross Alpha	6.61E-06 +/- 2.92E-06	2.63E-06
Th-232	-7.64E-06 +/- 1.27E-06	8.47E-06
Th-230	-2.34E-05 +/- 7.08E-06	1.40E-05
Th-228	-8.97E-06 +/- 2.94E-06	7.36E-06
<i>AS-2 - Mag Melt</i>		
Gross Alpha	8.17E-06 +/- 3.61E-06	3.39E-06
Th-232	-4.53E-06 +/- 4.00E-06	1.24E-05
Th-230	1.27E-05 +/- 1.50E-05	1.97E-05
Th-228	-1.43E-05 +/- 7.42E-06	1.65E-05
<i>AS-3 - Dry Sand Molding</i>		
Gross Alpha	1.27E-05 +/- 3.61E-06	3.00E-06
Th-232	1.70E-06 +/- 5.53E-06	1.07E-05
Th-230	-7.86E-06 +/- 1.09E-05	1.73E-05
Th-228	-5.11E-06 +/- 5.00E-06	9.42E-06

Note:

Reference 10 CFR 20, Appendix B for 10% DAC limits.

Sampling pumps calibrated to 25 liters/min flow rate; pumps run 24 hours.



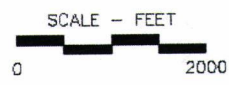
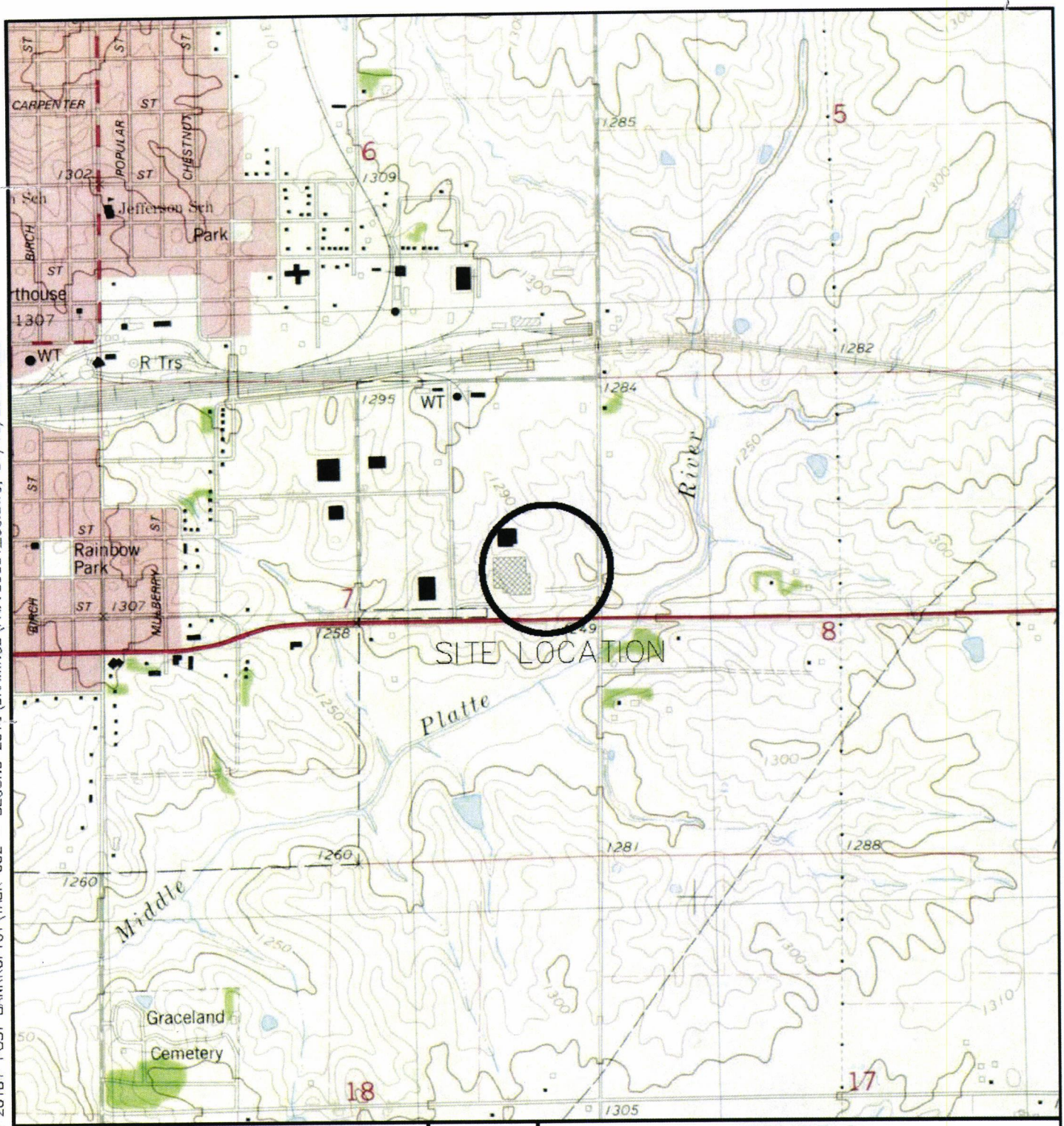
**Table 6**  
**Leachate Sampling Radioactivity Results**  
**WDC Acquisition, LLC Facility**  
**Second Semiannual Inspection - 2018**

<b>Parameter</b>	<b>Result (pCi/l)</b>			<b>Detection Limit (pCi/l)</b>
Gross Alpha	1.01	+/-	7.50	11.80
Th-232	-0.234	+/-	0.105	0.267
Th-230	-0.838	+/-	0.197	0.394
Th-228	-0.258	+/-	0.093	0.203
U-238	NA	+/-	NA	NA
U-235	NA	+/-	NA	NA
U-234	NA	+/-	NA	NA

Note:  
Reference 10 CFR 20, Appendix B

## FIGURES

S:\PROJECT FILES\4000-PA07799 WDC OPS 2018+ POST BANKRUPTCY\TASK 002 - SECOND 2013\DRAWINGS\PA7799001\_CC.DWG, 01/16/2019 2:50 PM



REFERENCE  
USGS 7.5-MIN TOPOGRAPHIC QUADRANGLE  
CRESTON EAST, IOWA, DATED 1980 SCALE  
1:24000.



FIGURE 1  
SITE LOCATION MAP

WDC ACQUISITION, LLC FACILITY  
CRESTON, IOWA

PREPARED FOR  
WDC ACQUISITION, LLC  
CRESTON, IOWA

APPROVED	RFV 11/14/2018
CHECKED	RFV 11/14/2018
DRAWN	DEB 05/16/2016
PROJECT NO.	4000-PA007799

DRAWING NUMBER  
PA7799001



**Penn E&R**  
Environmental & Remediation, Inc.



- 001 ● SMEAR SAMPLE LOCATIONS
- SURVEY ROUTE
- UPSTAIRS SURVEY ROUTE
- AS-1 ● AIR SAMPLING LOCATION
- DOSIMETRY BADGE LOCATION



Age Group	Number of People
18-24	20
25-34	40
35-44	60
45-54	80
55-64	100
65-74	160
75+	230

REVISION	DATE	DESCRIPTION
----------	------	-------------

FIGURE 2  
SURVEY MAP

WDC ACQUISITION, LLC FACILITY  
CRESTON, IOWA

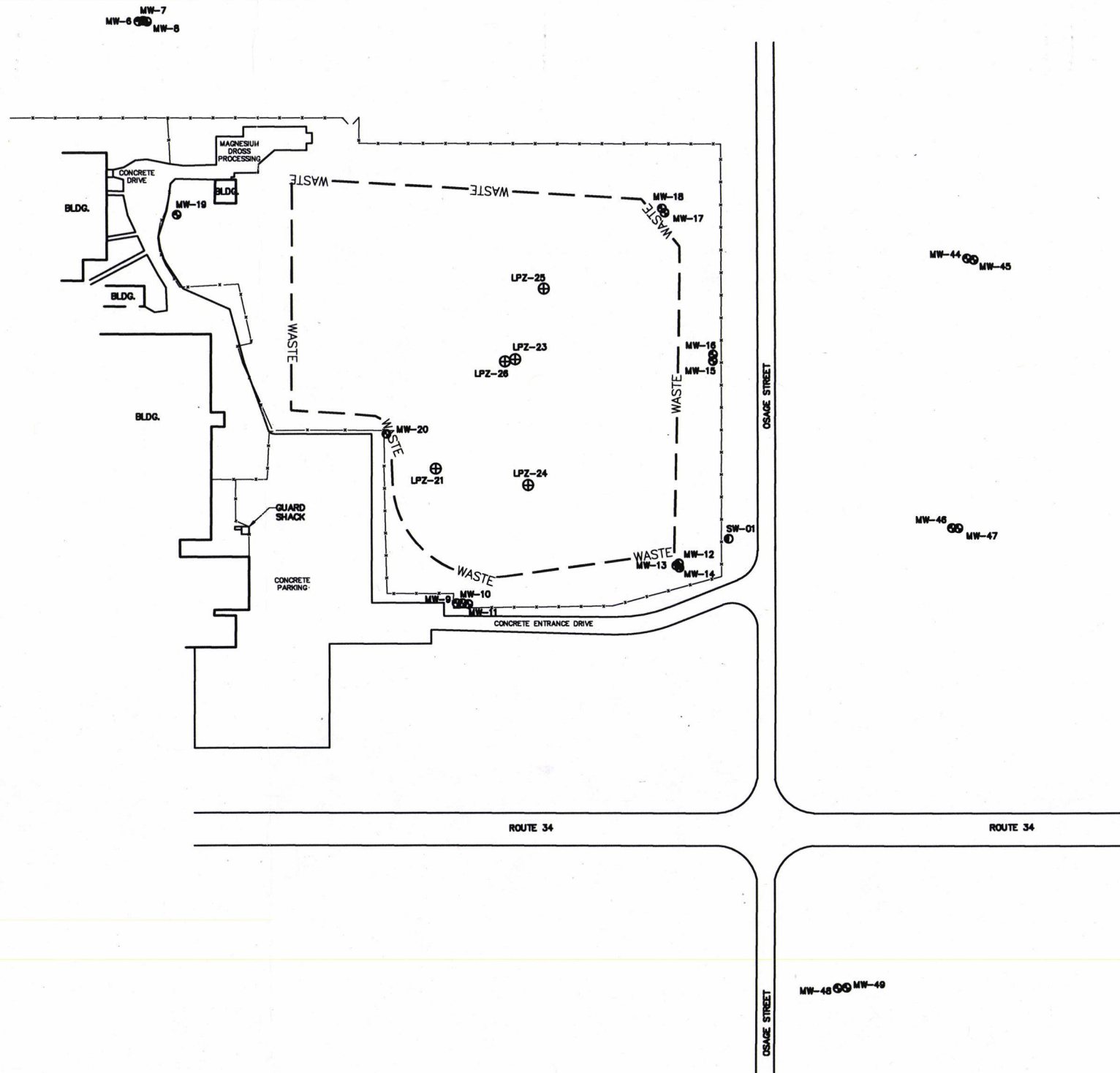
PREPARED FOR  
WDC ACQUISITION, LLC  
CRESTON, IOWA

APPROVED	RFV 07/12/2018
CHECKED	RFV 07/12/2018
DRAWN	DEB 05/16/2016
PROJECT NO.	4000-PA007799



**Penn E&R**  
Environmental & Remediation, Inc.

S:\PROJECT FILES\4000-PA007799 WDC OPS 2018- POST BANKRUPTCY TASK 002 - SECOND 2018 DRAWINGS\PA7799207.DWG, 1/16/2019 2:50 PM



#### LEGEND

- SW-01 ● SURFACE WATER MONITORING POINT (APPROXIMATE LOCATION)
- MW-16 ● MONITORING WELL
- LPZ-21 ⊕ LEACHATE PIEZOMETER
- WASTE — APPROXIMATE LANDFILL BOUNDARY
- x — CHAIN LINK FENCE

#### REFERENCE:

1. TAKEN FROM GREEN ENVIRONMENTAL SERVICES, INC. "HYDROGEOLOGIC INVESTIGATION REPORT" JANUARY 25, 1993.
2. TOPOGRAPHIC AND ELEVATION SURVEY BY GARDEN & ASSOCIATES, LTD., JUNE 13, 2018.



SCALE - FEET



REVISION	DATE	DESCRIPTION

### FIGURE 3 WELL LOCATION MAP

WDC ACQUISITION FACILITY  
CRESTON, IOWA

PREPARED FOR  
WDC ACQUISITION, LLC  
CRESTON, IOWA

APPROVED RFV 08/06/2018  
CHECKED RFV 08/06/2018  
DRAWN EWB 08/16/2018  
PROJECT NO. 4000-PA007799  
DRAWING NUMBER

PA7799207



**Penn E&R**  
Environmental & Remediation, Inc.

**APPENDIX A**  
**LABORATORY DATA**



# ANALYTICAL REPORT

November 15, 2018

## Fansteel Wellman Dyamics - ORL

Sample Delivery Group: L1035749  
Samples Received: 10/16/2018  
Project Number:  
Description: Rad Audit 2nd - 2018  
Site: PA-7799-002  
Report To: Matt Thelen  
1746 Commerce Road  
Creston, IA 50801

Entire Report Reviewed By:



Donna Eidson  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace National is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.



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ONE LAB. NATIONWIDE.



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<b>Al: Accreditations &amp; Locations</b>	<b>15</b>
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<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

# SAMPLE SUMMARY

ONE LAB. NATIONWIDE.



## 1 SHIPPING 001 L1035749-01 Filter

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Radiochemistry by Method EPA 9310	WG1193253	1	11/08/18 08:39	11/08/18 10:00	RGT

Collected by  
RV / MT

Collected date/time  
09/27/18 08:56

Received date/time  
10/16/18 10:38

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## 2 R. INSPECTION 002 L1035749-02 Filter

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Radiochemistry by Method EPA 9310	WG1193253	1	11/08/18 08:39	11/08/18 10:10	RGT

Collected by  
RV / MT

Collected date/time  
09/27/18 09:04

Received date/time  
10/16/18 10:38

## 3 WOMENS LOCKER ROOM 003 L1035749-03 Filter

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Radiochemistry by Method EPA 9310	WG1193253	1	11/08/18 08:39	11/08/18 10:21	RGT

Collected by  
RV / MT

Collected date/time  
09/27/18 09:09

Received date/time  
10/16/18 10:38

## 4 MAG MEOT 004 L1035749-04 Filter

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Radiochemistry by Method EPA 9310	WG1193253	1	11/08/18 08:39	11/08/18 10:31	RGT

Collected by  
RV / MT

Collected date/time  
09/27/18 09:45

Received date/time  
10/16/18 10:38

## 5 METR STORAGE 005 L1035749-05 Filter

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Radiochemistry by Method EPA 9310	WG1193253	1	11/08/18 08:39	11/08/18 10:41	RGT

Collected by  
RV / MT

Collected date/time  
09/27/18 09:52

Received date/time  
10/16/18 10:38

## 6 SAW ROOM 006 L1035749-06 Filter

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Radiochemistry by Method EPA 9310	WG1193253	1	11/08/18 08:39	11/08/18 10:51	RGT

Collected by  
RV / MT

Collected date/time  
09/27/18 09:23

Received date/time  
10/16/18 10:38

## 7 KNOCK OUT 007 L1035749-07 Filter

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Radiochemistry by Method EPA 9310	WG1193253	1	11/08/18 08:39	11/08/18 11:01	RGT

Collected by  
RV / MT

Collected date/time  
09/27/18 09:19

Received date/time  
10/16/18 10:38

## 8 MACHINE TRIM 008 L1035749-08 Filter

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Radiochemistry by Method EPA 9310	WG1193253	1	11/08/18 08:39	11/08/18 11:12	RGT

Collected by  
RV / MT

Collected date/time  
09/27/18 09:15

Received date/time  
10/16/18 10:38



# SAMPLE SUMMARY

ONE LAB. NATIONWIDE.



## 9 CAFETERIA 009 L1035749-09 Filter

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Radiochemistry by Method EPA 9310	WG1193253	1	11/08/18 08:39	11/08/18 11:22	RGT

Collected by  
RV / MT

Collected date/time  
09/27/18 11:00

Received date/time  
10/16/18 10:38

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## 10 MENS LOCKER ROOM 010 L1035749-10 Filter

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Radiochemistry by Method EPA 9310	WG1193253	1	11/08/18 08:39	11/08/18 11:32	RGT

Collected by  
RV / MT

Collected date/time  
09/27/18 11:05

Received date/time  
10/16/18 10:38

## AS-1 L1035749-11 Filter

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Radiochemistry by Method EPA 9310	WG1193559	1	11/08/18 08:34	11/08/18 18:05	MK
Radiochemistry by Method LANL ER200M	WG1193362	1	11/08/18 10:42	11/12/18 17:44	RGT

Collected by  
RV / MT

Collected date/time  
09/27/18 00:00

Received date/time  
10/16/18 10:38

## AS-2 L1035749-12 Filter

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Radiochemistry by Method EPA 9310	WG1193559	1	11/08/18 08:34	11/08/18 18:03	MK
Radiochemistry by Method LANL ER200M	WG1193362	1	11/08/18 10:42	11/12/18 17:44	RGT

Collected by  
RV / MT

Collected date/time  
09/27/18 00:00

Received date/time  
10/16/18 10:38

## AS-3 L1035749-13 Filter

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Radiochemistry by Method EPA 9310	WG1193559	1	11/08/18 08:34	11/08/18 18:03	MK
Radiochemistry by Method LANL ER200M	WG1193362	1	11/08/18 10:42	11/12/18 17:44	RGT

Collected by  
RV / MT

Collected date/time  
09/27/18 08:00

Received date/time  
10/16/18 10:38

## WTS L1035749-14 Non-Potable Water

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Radiochemistry by Method 900	WG1182047	1	10/18/18 08:05	10/23/18 19:12	MK
Radiochemistry by Method LANL ER200M	WG1178612	1	10/26/18 14:00	10/30/18 17:55	RGT

# CASE NARRATIVE

ONE LAB. NATIONWIDE.



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Donna Eidson  
Project Manager

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

ACCOUNT:

Fansteel Wellman Dynamics - ORL

PROJECT:

SDG:

L1035749

DATE/TIME:

11/15/18 12:10

PAGE:

5 of 18



## 1 SHIPPING 001

Collected date/time: 09/27/18 08:56

## SAMPLE RESULTS - 01

L1035749

ONE LAB. NATIONWIDE.



## Radiochemistry by Method EPA 9310

Analyte	Result	Qualifier	Uncertainty	MDA	Analysis Date	Batch
	pCi/f		+ / -	pCi/f	date / time	
GROSS ALPHA	-0.846		0.878	2.76	11/08/2018 10:00	<a href="#">WG1193253</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## 2 R. INSPECTION 002

Collected date/time: 09/27/18 09:04

## SAMPLE RESULTS - 02

L1035749

## Radiochemistry by Method EPA 9310

Analyte	Result	Qualifier	Uncertainty	MDA	Analysis Date	Batch
	pCi/f		+ / -	pCi/f	date / time	
GROSS ALPHA	-0.508		0.995	2.76	11/08/2018 10:10	<a href="#">WG1193253</a>

## 3 WOMENS LOCKER ROOM 003

Collected date/time: 09/27/18 09:09

## SAMPLE RESULTS - 03

L1035749

## Radiochemistry by Method EPA 9310

Analyte	Result	Qualifier	Uncertainty	MDA	Analysis Date	Batch
	pCi/f		+ / -	pCi/f	date / time	
GROSS ALPHA	-0.846		0.878	2.76	11/08/2018 10:21	<a href="#">WG1193253</a>

## 4 MAG MEOT 004

Collected date/time: 09/27/18 09:45

## SAMPLE RESULTS - 04

L1035749

## Radiochemistry by Method EPA 9310

Analyte	Result	Qualifier	Uncertainty	MDA	Analysis Date	Batch
	pCi/f		+ / -	pCi/f	date / time	
GROSS ALPHA	-1.02		0.813	2.76	11/08/2018 10:31	<a href="#">WG1193253</a>

## 5 METR STORAGE 005

Collected date/time: 09/27/18 09:52

## SAMPLE RESULTS - 05

L1035749

## Radiochemistry by Method EPA 9310

Analyte	Result	Qualifier	Uncertainty	MDA	Analysis Date	Batch
	pCi/f		+ / -	pCi/f	date / time	
GROSS ALPHA	-0.508		0.995	2.76	11/08/2018 10:41	<a href="#">WG1193253</a>

## 6 SAW ROOM 006

Collected date/time: 09/27/18 09:23

## SAMPLE RESULTS - 06

L1035749

## Radiochemistry by Method EPA 9310

Analyte	Result	Qualifier	Uncertainty	MDA	Analysis Date	Batch
	pCi/f		+ / -	pCi/f	date / time	
GROSS ALPHA	-0.846		0.878	2.76	11/08/2018 10:51	<a href="#">WG1193253</a>

## 7 KNOCK OUT 007

Collected date/time: 09/27/18 09:19

## SAMPLE RESULTS - 07

L1035749

## Radiochemistry by Method EPA 9310

Analyte	Result	Qualifier	Uncertainty	MDA	Analysis Date	Batch
	pCi/f		+ / -	pCi/f	date / time	
GROSS ALPHA	-0.846		0.878	2.76	11/08/2018 11:01	<a href="#">WG1193253</a>

ACCOUNT:

Fansteel Wellman Dynamics - ORL

PROJECT:

SDG:

L1035749

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## 8 MACHINE TRIM 008

Collected date/time: 09/27/18 09:15

## SAMPLE RESULTS - 08

L1035749

ONE LAB. NATIONWIDE.

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## Radiochemistry by Method EPA 9310

Analyte	Result	Qualifier	Uncertainty	MDA	Analysis Date	Batch
	pCi/f		+ / -	pCi/f	date / time	
GROSS ALPHA	-0.508		0.995	2.76	11/08/2018 11:12	<a href="#">WG1193253</a>

## 9 CAFETERIA 009

Collected date/time: 09/27/18 11:00

## SAMPLE RESULTS - 09

L1035749

## Radiochemistry by Method EPA 9310

Analyte	Result	Qualifier	Uncertainty	MDA	Analysis Date	Batch
	pCi/f		+ / -	pCi/f	date / time	
GROSS ALPHA	-0.508		0.995	2.76	11/08/2018 11:22	<a href="#">WG1193253</a>

## 10 MENS LOCKER ROOM 010

Collected date/time: 09/27/18 11:05

## SAMPLE RESULTS - 10

L1035749

## Radiochemistry by Method EPA 9310

Analyte	Result	Qualifier	Uncertainty	MDA	Analysis Date	Batch
	pCi/f		+ / -	pCi/f	date / time	
GROSS ALPHA	-1.02		0.813	2.76	11/08/2018 11:32	<a href="#">WG1193253</a>

## AS-1

Collected date/time: 09/27/18 00:00

## SAMPLE RESULTS - 11

L1035749

## Radiochemistry by Method EPA 9310

Analyte	Result	Qualifier	Uncertainty	MDA	Analysis Date	Batch
	pCi/f		+ / -	pCi/f	date / time	
GROSS ALPHA	0.238		0.105	0.0946	11/08/2018 18:05	<a href="#">WG1193559</a>

## Radiochemistry by Method LANL ER200M

Analyte	Result	Qualifier	Uncertainty	MDA	Analysis Date	Batch
	uCi/ml air		+ / -	uCi/ml air	date / time	
THORIUM-228	-6.29E-16		2.06E-16	5.16E-16	11/12/2018 17:44	<a href="#">WG1193362</a>
THORIUM-230	4.96E-16		9.80E-16	-6.29E-16	11/12/2018 17:44	<a href="#">WG1193362</a>
THORIUM-232	-5.36E-16		8.91E-17	5.95E-16	11/12/2018 17:44	<a href="#">WG1193362</a>
(T) THORIUM-229	83.0			30.0-110	11/12/2018 17:44	<a href="#">WG1193362</a>

## AS-2

Collected date/time: 09/27/18 00:00

## SAMPLE RESULTS - 12

L1035749

## Radiochemistry by Method EPA 9310

Analyte	Result	Qualifier	Uncertainty	MDA	Analysis Date	Batch
	pCi/f		+ / -	pCi/f	date / time	
GROSS ALPHA	0.294		0.130	0.122	11/08/2018 18:03	<a href="#">WG1193559</a>

## Radiochemistry by Method LANL ER200M

Analyte	Result	Qualifier	Uncertainty	MDA	Analysis Date	Batch
	uCi/ml air		+ / -	uCi/ml air	date / time	
THORIUM-228	-1.03E-15		5.35E-16	1.19E-15	11/12/2018 17:44	<a href="#">WG1193362</a>
THORIUM-230	1.08E-15		1.42E-15	-1.03E-15	11/12/2018 17:44	<a href="#">WG1193362</a>
THORIUM-232	-3.27E-16		2.88E-16	8.91E-16	11/12/2018 17:44	<a href="#">WG1193362</a>
(T) THORIUM-229	41.1			30.0-110	11/12/2018 17:44	<a href="#">WG1193362</a>

ACCOUNT:

Fansteel Wellman Dynamics - ORL

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L1035749

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AS-3

Collected date/time: 09/27/18 00:00

## SAMPLE RESULTS - 13

L1035749

ONE LAB. NATIONWIDE.



## Radiochemistry by Method EPA 9310

Analyte	Result	Qualifier	Uncertainty	MDA	Analysis Date	Batch
	pCi/f		+ / -	pCi/f	date / time	
GROSS ALPHA	0.458		0.130	0.108	11/08/2018 18:03	<a href="#">WG1193559</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 GI

8 AI

9 Sc

## Radiochemistry by Method LANL ER200M

Analyte	Result	Qualifier	Uncertainty	MDA	Analysis Date	Batch
	uCi/ml air		+ / -	uCi/ml air	date / time	
THORIUM-228	-3.67E-16		3.58E-16	6.75E-16	11/12/2018 17:44	<a href="#">WG1193362</a>
THORIUM-230	7.82E-16		1.24E-15	-3.67E-16	11/12/2018 17:44	<a href="#">WG1193362</a>
THORIUM-232	1.22E-16		3.97E-16	7.67E-16	11/12/2018 17:44	<a href="#">WG1193362</a>
(T) THORIUM-229	62.5			30.0-110	11/12/2018 17:44	<a href="#">WG1193362</a>

WTS

Collected date/time: 09/27/18 08:00

## SAMPLE RESULTS - 14

L1035749

## Radiochemistry by Method 900

Analyte	Result	Qualifier	Uncertainty	MDA	Analysis Date	Batch
	pCi/l		+ / -	pCi/l	date / time	
GROSS ALPHA	1.01		7.50	11.8	10/23/2018 19:12	<a href="#">WG1182047</a>

## Radiochemistry by Method LANL ER200M

Analyte	Result	Qualifier	Uncertainty	MDA	Analysis Date	Batch
	pCi/l		+ / -	pCi/l	date / time	
THORIUM-228	-0.258		0.0931	0.203	10/30/2018 17:55	<a href="#">WG1178612</a>
THORIUM-230	-0.838		0.197	0.394	10/30/2018 17:55	<a href="#">WG1178612</a>
THORIUM-232	-0.234		0.105	0.267	10/30/2018 17:55	<a href="#">WG1178612</a>
(T) THORIUM-229	84.8			30.0-110	10/30/2018 17:55	<a href="#">WG1178612</a>

ACCOUNT:

Fansteel Wellman Dynamics - ORL

PROJECT:

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L1035749

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WG1182047

Radiochemistry by Method 900

## QUALITY CONTROL SUMMARY

ONE LAB. NATIONWIDE.

L1035749-14

## Method Blank (MB)

(MB) R3354245-1 10/23/18 19:12

Analyte	MB Result pCi/l	MB Qualifier	MB MDA pCi/l
GROSS ALPHA	-0.113		0.835

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## L1035437-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1035437-03 10/25/18 10:01 • (DUP) R3354245-4 10/25/18 10:02

Analyte	Original Result pCi/l	DUP Result pCi/l	Dilution	DUP RPD %	DUP RER	DUP Qualifier	DUP RPD Limits %	DUP RER Limit pCi/l
GROSS ALPHA	-0.367	0.0330	1	200	0.294		20	3

## Laboratory Control Sample (LCS)

(LCS) R3354245-3 10/25/18 10:02

Analyte	Spike Amount pCi/l	LCS Result pCi/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
GROSS ALPHA	15.0	13.7	91.3	80.0-120	

## L1035437-04 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1035437-04 10/25/18 10:01 • (MS) R3354245-5 10/25/18 10:02 • (MSD) R3354245-2 10/25/18 10:01

Analyte	Spike Amount pCi/l	Original Result pCi/l	MS Result pCi/l	MSD Result pCi/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	MS RER	RPD Limits %
GROSS ALPHA	15.0	0.389	12.4	12.2	80.1	78.5	1	70.0-130			2.04		20

ACCOUNT:

Fansteel Wellman Dynamics - ORL

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Radiochemistry by Method EPA 9310

## QUALITY CONTROL SUMMARY

ONE LAB. NATIONWIDE.

[L1035749-01,02,03,04,05,06,07,08,09,10](#)

## Method Blank (MB)

(MB) R3359664-2 11/08/18 09:50

Analyte	MB Result pCi/f	MB Qualifier	MB MDA pCi/f
GROSS ALPHA	-0.339		2.76

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

## L1035749-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1035749-01 11/08/18 10:00 • (DUP) R3359664-3 11/08/18 11:42

Analyte	Original Result pCi/f	DUP Result pCi/f	Dilution	DUP RPD %	DUP RER	DUP Qualifier	DUP RPD Limits %	DUP RER Limit pCi/f
GROSS ALPHA	-0.846	-0.846	1	0.000	0.000		20	3

## Laboratory Control Sample (LCS)

(LCS) R3359664-1 11/08/18 09:09

Analyte	Spike Amount pCi/f	LCS Result pCi/f	LCS Rec. %	Rec. Limits %	LCS Qualifier
GROSS ALPHA	8550	9220	108	29.9-170	

7 GI

8 AI

9 Sc

WG1193559

## QUALITY CONTROL SUMMARY

ONE LAB. NATIONWIDE.



Radiochemistry by Method EPA 9310

L1035749-11,12,13

## Method Blank (MB)

(MB) R3358386-2 11/08/18 18:05

	MB Result	MB Qualifier	MB MDA
Analyte	Bq/f		Bq/f
GROSS ALPHA	-0.00102		0.00427

<sup>1</sup> Cp<sup>2</sup> Tc<sup>3</sup> Ss<sup>4</sup> Cn<sup>5</sup> Sr<sup>6</sup> Qc

## L1035749-11 Original Sample (OS) • Duplicate (DUP)

(OS) L1035749-11 11/08/18 18:05 • (DUP) R3358386-1 11/08/18 14:44

	Original Result	DUP Result	Dilution	DUP RPD	DUP RER	DUP Qualifier	DUP RPD Limits	DUP RER Limit
Analyte	pCi/f	pCi/f		%			%	pCi/f
GROSS ALPHA	0.238	0.161	1	38.6	0.312		20	3

<sup>7</sup> GI<sup>8</sup> AI<sup>9</sup> Sc

## Laboratory Control Sample (LCS)

(LCS) R3358386-3 11/08/18 18:05

	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Analyte	Bq/f	Bq/f	%	%	
GROSS ALPHA	0.970	0.528	54.4	29.9-170	





## Method Blank (MB)

(MB) R3355677-1 10/30/18 17:55

Analyte	MB Result pCi/l	MB Qualifier	MB MDA pCi/l
THORIUM-228	-0.0332		0.0483
THORIUM-230	-0.200		0.0933
THORIUM-232	-0.0388		0.0560
(T) THORIUM-229	86.1		

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 GI

8 Al

9 Sc

## L1035749-14 Original Sample (OS) • Duplicate (DUP)

(OS) L1035749-14 10/30/18 17:55 • (DUP) R3355677-5 10/30/18 17:55

Analyte	Original Result pCi/l	DUP Result pCi/l	Dilution	DUP RPD %	DUP RER	DUP Qualifier	DUP RPD Limits	DUP RER Limit pCi/l
THORIUM-228	-0.258	0.0187	1	200	1.70		20	3
THORIUM-230	-0.838	-0.172	1	0.000	1.99		20	3
THORIUM-232	-0.234	-0.188	1	0.000	0.379		20	3
(T) THORIUM-229	84.8	80.4						

## Laboratory Control Sample (LCS)

(LCS) R3355677-2 10/30/18 17:55

Analyte	Spike Amount pCi/l	LCS Result pCi/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
THORIUM-228	2.00	1.94	97.1	80.0-120	
THORIUM-230	1.99	2.00	101	80.0-120	
THORIUM-232	2.00	2.11	106	80.0-120	
(T) THORIUM-229			91.1		

## L1035749-14 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1035749-14 10/30/18 17:55 • (MS) R3355677-3 10/30/18 17:55 • (MSD) R3355677-4 10/30/18 17:55

Analyte	Spike Amount pCi/l	Original Result pCi/l	MS Result pCi/l	MSD Result pCi/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	MS RER	RPD Limits %
THORIUM-228	8.00	-0.258	8.25	6.91	103	86.4	1	75.0-125			17.6		20
THORIUM-230	7.97	-0.838	8.82	7.27	111	91.2	1	75.0-125			19.3		20
THORIUM-232	8.00	-0.234	7.85	6.92	98.1	86.4	1	75.0-125			12.6		20
(T) THORIUM-229		84.8			90.8	98.1							



WG1193362

Radiochemistry by Method LANL ER200M

## QUALITY CONTROL SUMMARY

ONE LAB. NATIONWIDE.



## Method Blank (MB)

(MB) R3359349-1 11/12/18 17:44

Analyte	MB Result pCi/l	MB Qualifier	MB MDA pCi/l
THORIUM-228	-0.0664		0.0446
THORIUM-230	-0.186		0.0996
THORIUM-232	-0.0457		0.0616
(T) THORIUM-229	91.5		

1  
Pp2  
Tc3  
Ss4  
Cn5  
Sr6  
Qc7  
Gl8  
Al9  
Sc

## L1035749-12 Original Sample (OS) • Duplicate (DUP)

(OS) L1035749-12 11/12/18 17:44 • (DUP) R3359349-4 11/12/18 17:44

Analyte	Original Result uCi/ml air	DUP Result uCi/ml air	Dilution	DUP RPD %	DUP RER	DUP Qualifier	DUP RPD Limits %	DUP RER Limit uCi/ml air
THORIUM-228	-1.03E-15	-7.66E-16	1	0.000	0.309		20	3
THORIUM-230	1.08E-15	1.20E-15	1	10.0	0.0424		20	3
THORIUM-232	-3.27E-16	-5.21E-16	1	0.000	0.333		20	3
(T) THORIUM-229	41.1	73.4						

## Laboratory Control Sample (LCS)

(LCS) R3359349-2 11/12/18 17:44

Analyte	Spike Amount pCi/l	LCS Result pCi/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
THORIUM-228	2.00	1.78	88.9	80.0-120	
THORIUM-230	1.99	1.94	97.6	80.0-120	
THORIUM-232	2.00	1.79	89.7	80.0-120	
(T) THORIUM-229			94.2		

## L1035749-11 Original Sample (OS) • Matrix Spike (MS)

(OS) L1035749-11 11/12/18 17:44 • (MS) R3359349-3 11/12/18 17:44

Analyte	Spike Amount uCi/ml air	Original Result uCi/ml air	MS Result uCi/ml air	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
THORIUM-228	4.01E-14	-6.29E-16	3.83E-14	95.6	1	75.0-125	
THORIUM-230	3.99E-14	4.96E-16	4.12E-14	102	1	75.0-125	
THORIUM-232	4.01E-14	-5.36E-16	4.08E-14	102	1	75.0-125	
(T) THORIUM-229		83.0		83.2			





## Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

## Abbreviations and Definitions

MDA	Minimum Detectable Activity.
Rec.	Recovery.
RER	Replicate Error Ratio.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(T)	Tracer - A radioisotope of known concentration added to a solution of chemically equivalent radioisotopes at a known concentration to assist in monitoring the yield of the chemical separation.
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

## Qualifier Description

The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



# ACCREDITATIONS & LOCATIONS

ONE LAB. NATIONWIDE.



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
\* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1 6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1 4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T 104704245-17-14
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

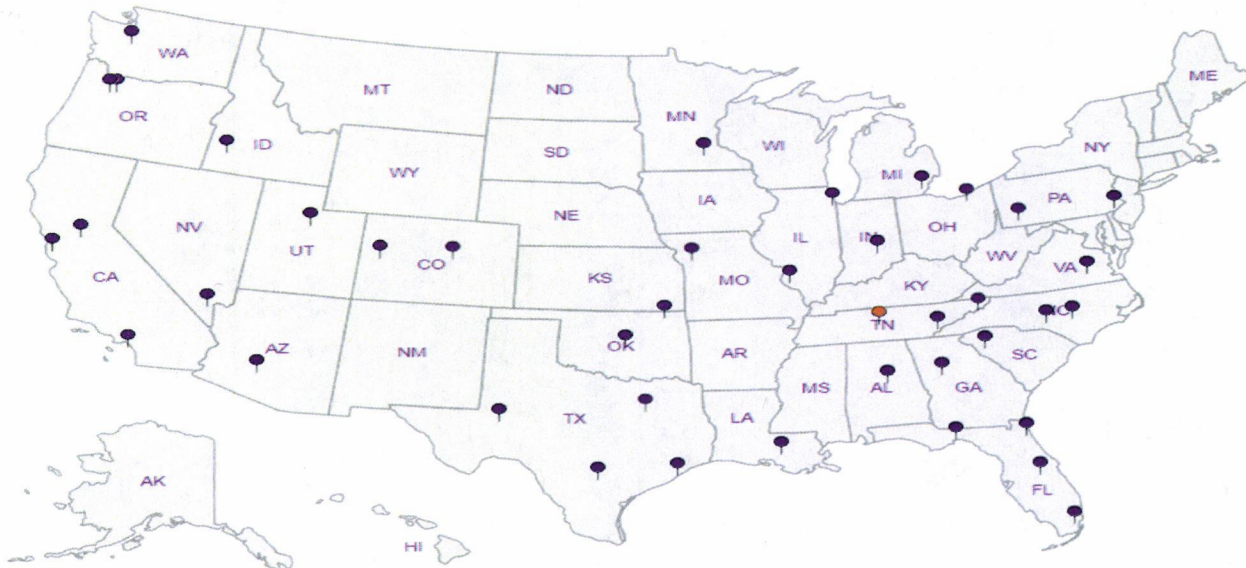
## Third Party Federal Accreditations

A2LA - ISO 17025	1461.01	AIHA-LAP, LLC EMLAP	100789
A2LA - ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.






<b>Company Name:</b> Wellman Dynamic s <b>Contact Name:</b> Matt Thelen <b>Address:</b> 1746 Commerce Road, Creston, IA 50801  <b>Phone:</b> 641/782-0283 <b>Results Email:</b> matt.thelen@wellmandynamics.com				<b>Bill to:</b> Wellman Dynamic s <b>Contact Name:</b> Mary Dodson <b>Address:</b> 1746 Commerce Road, Creston, IA 50801  <b>Phone:</b> 641/782-0225 <b>Bill to Email:</b> mary.dodson@wellmandynamics.com				<b>Analysis / Container / Preservative</b>				<b>Chain of Custody</b> Page ____ of ____	
<b>Project Name:</b> <b>PA 7799-002</b>				<b>Project Description:</b> <b>Rad Audit 2nd - 2018</b>				<div style="display: flex; justify-content: space-around;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Thorium Isotopes</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Uranium Isotopes</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Gross Alpha</div> </div>				<b>Face Analytical</b> 11065 Lebanon Rd Mount Juliet, TN 37122 Phone: 615-758-5858 Phone: 800-767-5859 Fax: 615-758-5859	
<b>City/State Collected:</b> Creston, IA		<b>Lab Project #</b>		<b>Site/Facility ID#</b>		<b>L#</b> 1035745 <b>1146</b>							
<b>Collected by (print):</b> Rich Vannucci/Matt Thelen		<b>P.O. #</b> 119025		<b>Accrual:</b> <b>Template:</b> <b>Prelogin:</b> <b>PM:</b> Donna Eidson <b>FB:</b> <b>Shipped Via:</b>									
<b>Collected by (signature):</b>		<b>Rush?</b> (Lab MUST Be Notified) Surcharges apply - call for pricing.											
<b>Immediately Packed on Ice:</b> N ____ Y ____		<b>Date Results Needed</b> Email? ____ No ____ Yes ____ FAX? ____ No ____ Yes ____											
				<b>No. of Cntr</b>									
<b>Sample ID</b>	<b>Comp/Grab</b>	<b>Matrix *</b>	<b>Depth</b>	<b>Date</b>	<b>Time</b>								
1	Grab	Solid		9/27/2018	See ID	1			X				
2	Grab	Solid		9/27/2018	See ID	1			X				
3	Grab	Solid		9/27/2018	See ID	1			X				
4	Grab	Solid		9/27/2018	See ID	1			X				
5	Grab	Solid		9/27/2018	See ID	1			X				
6	Grab	Solid		9/27/2018	See ID	1			X				
7	Grab	Solid		9/27/2018	See ID	1			X				
8	Grab	Solid		9/27/2018	See ID	1			X				
9	Grab	Solid		9/27/2018	See ID	1			X				
10	Grab	Solid		9/27/2018	See ID	1			X				
AS-1	Grab	Solid		9/27/2018	See ID	1	X		X				
AS-2	Grab	Solid		9/27/2018	See ID	1	X		X				
AS-3	Grab	Solid		9/27/2018	See ID	1	X		X				
WTS	Grab	AQ		9/27/2018	See ID	1	X		X				
* Matrix: SS - Soil GW - Groundwater WW - WasteWater DW - Drinking Water OT - Other _____													
<b>Comments:</b>						<b>RAD SCREEN: &lt;0.5 mR/hr</b>							
<b>Relinquished by: (Signature)</b> 				<b>Date:</b> 10/12/18		<b>Time:</b> 8:00 AM		<b>Received by: (Signature)</b> 					
<b>Relinquished by: (Signature)</b> 				<b>Date:</b>		<b>Time:</b>		<b>Received by: (Signature)</b> 					
<b>Relinquished by: (Signature)</b> 				<b>Date:</b>		<b>Time:</b>		<b>Received for lab by: (Signature)</b> 					
<b>Samples returned via:</b> <input type="checkbox"/> UPS <input type="checkbox"/> FedEx <input type="checkbox"/> Courier <input type="checkbox"/> _____								<b>Condition:</b> (lab use only)					
<b>Temp:</b> 11.95 ± 0.2 °C <b>Bottles Received:</b> 14								<b>COC Seal Intact:</b> Y ____ N ____ NA ____					
<b>Date:</b> 10/12/18 <b>Time:</b> 1058								<b>pH Checked:</b> NCF:					

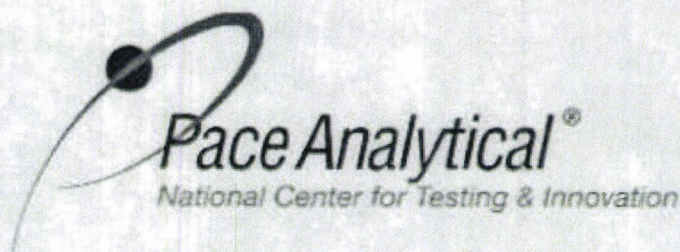


## Pace Analytical National Center for Testing & Innovation

### Cooler Receipt Form

Client: <u>Fairwell</u>	SDG#	<u>103 5749</u>		
Cooler Received/Opened On: 10/ 16 /18	Temperature:	<u>12.1</u>		
Received By: Kevin Turner				
Signature: 				
Receipt Check List		NP	Yes	No
COC Seal Present / Intact?		/		
COC Signed / Accurate?			/	
Bottles arrive intact?			/	
Correct bottles used?			/	
Sufficient volume sent?			/	
If Applicable				
VOA Zero headspace?				
Preservation Correct / Checked?				





Login #:1035749	Client: FANWELLORL	Date:10/17	Evaluated by:Matt S
-----------------	--------------------	------------	---------------------

**Non-Conformance (check applicable items)**

Sample Integrity	Chain of Custody Clarification	
Parameter(s) past holding time	x Login Clarification Needed	<b>If Broken Container:</b>
Improper temperature	Chain of custody is incomplete	Insufficient packing material around container
Improper container type	Please specify Metals requested.	Insufficient packing material inside cooler
Improper preservation	Please specify TCLP requested.	Improper handling by carrier (FedEx / UPS / Courier)
Insufficient sample volume.	Received additional samples not listed on coc.	Sample was frozen
Sample is biphasic.	Sample ids on containers do not match ids on coc	Container lid not intact
Vials received with headspace.	Trip Blank not received.	<b>If no Chain of Custody:</b>
Broken container	Client did not "X" analysis.	Received by:
Broken container:	Chain of Custody is missing	Date/Time:
Sufficient sample remains		Temp./Cont. Rec./pH:
		Carrier:
		Tracking#

**Login Comments: WTS leachate sample not preserved. Preserved in lab**

Client informed by:	Call	Email	Voice Mail	Date:	Time:
TSR Initials: DE11/19/18	Client Contact:				

**Login Instructions:**

Noted

Notice: This communication and any attached files may contain privileged or other confidential information. If you have received this in error, please contact the sender immediately via reply email and immediately delete the message and any attachments without copying or disclosing the contents. Thank you.



# ANALYTICAL REPORT

October 11, 2018

## Fansteel Wellman Dyamics - ORL

Sample Delivery Group: L1027871  
Samples Received: 09/21/2018  
Project Number:  
Description: Fansteel-Creston  
  
Report To: Matt Thelen  
1746 Commerce Road  
Creston, IA 50801

Entire Report Reviewed By:



Donna Eidson  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace National is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.

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ONE LAB. NATIONWIDE.



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<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



# SAMPLE SUMMARY

ONE LAB. NATIONWIDE.



## MW-8 L1027871-01 Non-Potable Water

			Collected by RG / TM	Collected date/time 09/11/18 14:35	Received date/time 09/21/18 10:55
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Radiochemistry by Method D3972	WG1167263	1	09/25/18 11:16	09/27/18 15:01	RGT
Radiochemistry by Method LANL ER200M	WG1170962	1	09/25/18 14:59	09/28/18 17:36	RGT

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> GI

<sup>8</sup> AI

<sup>9</sup> Sc

## MW-11 L1027871-02 Non-Potable Water

			Collected by RG / TM	Collected date/time 09/12/18 17:05	Received date/time 09/21/18 10:55
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Radiochemistry by Method D3972	WG1172224	1	10/04/18 09:00	10/08/18 18:03	RGT
Radiochemistry by Method LANL ER200M	WG1170962	1	09/25/18 14:59	09/28/18 17:36	RGT

## MW-13 L1027871-03 Non-Potable Water

			Collected by RG / TM	Collected date/time 09/13/18 10:15	Received date/time 09/21/18 10:55
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Radiochemistry by Method D3972	WG1172224	1	10/04/18 09:00	10/08/18 18:03	RGT
Radiochemistry by Method LANL ER200M	WG1170962	1	09/25/18 14:59	09/28/18 17:36	RGT

## MW-19 L1027871-04 Non-Potable Water

			Collected by RG / TM	Collected date/time 09/12/18 15:10	Received date/time 09/21/18 10:55
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Radiochemistry by Method D3972	WG1172224	1	10/04/18 09:00	10/08/18 18:03	RGT
Radiochemistry by Method LANL ER200M	WG1170962	1	09/25/18 14:59	09/28/18 17:36	RGT

## MW-20 L1027871-05 Non-Potable Water

			Collected by RG / TM	Collected date/time 09/12/18 19:00	Received date/time 09/21/18 10:55
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Radiochemistry by Method D3972	WG1172224	1	10/04/18 09:00	10/08/18 18:03	RGT
Radiochemistry by Method LANL ER200M	WG1170962	1	09/25/18 14:59	09/28/18 17:36	RGT

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All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Donna Eidson  
Project Manager

<sup>1</sup> Cp<sup>2</sup> Tc<sup>3</sup> Ss<sup>4</sup> Cn<sup>5</sup> Sr<sup>6</sup> Qc<sup>7</sup> Gl<sup>8</sup> Al<sup>9</sup> Sc



MW-8

Collected date/time: 09/11/18 14:35

## SAMPLE RESULTS - 01

L1027871

ONE LAB. NATIONWIDE.



## Radiochemistry by Method D3972

Analyte	Result pCi/l	Qualifier	Uncertainty + / -	MDA pCi/l	Analysis Date date / time	Batch
URANIUM-234	6.05		1.16	0.377	09/27/2018 15:01	<a href="#">WG1167263</a>
URANIUM-235	0.128		0.198	0.254	09/27/2018 15:01	<a href="#">WG1167263</a>
URANIUM-238	5.77		1.03	0.222	09/27/2018 15:01	<a href="#">WG1167263</a>
(T) URANIUM-232	69.7			30.0-110	09/27/2018 15:01	<a href="#">WG1167263</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 GI

8 AI

9 Sc

## Radiochemistry by Method LANL ER200M

Analyte	Result pCi/l	Qualifier	Uncertainty + / -	MDA pCi/l	Analysis Date date / time	Batch
THORIUM-228	-0.303		0.100	0.253	09/28/2018 17:36	<a href="#">WG1170962</a>
THORIUM-230	-0.923		0.244	0.507	09/28/2018 17:36	<a href="#">WG1170962</a>
THORIUM-232	-0.246		0.0759	0.314	09/28/2018 17:36	<a href="#">WG1170962</a>
(T) THORIUM-229	88.4			30.0-110	09/28/2018 17:36	<a href="#">WG1170962</a>

MW-11

Collected date/time: 09/12/18 17:05

## SAMPLE RESULTS - 02

L1027871

## Radiochemistry by Method D3972

Analyte	Result pCi/l	Qualifier	Uncertainty + / -	MDA pCi/l	Analysis Date date / time	Batch
URANIUM-234	0.221		0.456	0.209	10/08/2018 18:03	<a href="#">WG1172224</a>
URANIUM-235	0.215		0.225	0.24	10/08/2018 18:03	<a href="#">WG1172224</a>
URANIUM-238	0.645		0.354	0.283	10/08/2018 18:03	<a href="#">WG1172224</a>
(T) URANIUM-232	71.0			30.0-110	10/08/2018 18:03	<a href="#">WG1172224</a>

## Radiochemistry by Method LANL ER200M

Analyte	Result pCi/l	Qualifier	Uncertainty + / -	MDA pCi/l	Analysis Date date / time	Batch
THORIUM-228	-0.268		0.115	0.224	09/28/2018 17:36	<a href="#">WG1170962</a>
THORIUM-230	-0.841		0.221	0.414	09/28/2018 17:36	<a href="#">WG1170962</a>
THORIUM-232	-0.157		0.0993	0.25	09/28/2018 17:36	<a href="#">WG1170962</a>
(T) THORIUM-229	104			30.0-110	09/28/2018 17:36	<a href="#">WG1170962</a>

MW-13

Collected date/time: 09/13/18 10:15

## SAMPLE RESULTS - 03

L1027871

## Radiochemistry by Method D3972

Analyte	Result pCi/l	Qualifier	Uncertainty + / -	MDA pCi/l	Analysis Date date / time	Batch
URANIUM-234	0.354		0.468	0.225	10/08/2018 18:03	<a href="#">WG1172224</a>
URANIUM-235	-0.00550		0.0915	0.197	10/08/2018 18:03	<a href="#">WG1172224</a>
URANIUM-238	0.963		0.404	0.225	10/08/2018 18:03	<a href="#">WG1172224</a>
(T) URANIUM-232	72.8			30.0-110	10/08/2018 18:03	<a href="#">WG1172224</a>

## Radiochemistry by Method LANL ER200M

Analyte	Result pCi/l	Qualifier	Uncertainty + / -	MDA pCi/l	Analysis Date date / time	Batch
THORIUM-228	-0.129		0.151	0.251	09/28/2018 17:36	<a href="#">WG1170962</a>
THORIUM-230	-0.130		0.336	0.494	09/28/2018 17:36	<a href="#">WG1170962</a>
THORIUM-232	-0.202		0.0848	0.3	09/28/2018 17:36	<a href="#">WG1170962</a>
(T) THORIUM-229	84.9			30.0-110	09/28/2018 17:36	<a href="#">WG1170962</a>

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Fansteel Wellman Dynamics - ORL

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MW-19

Collected date/time: 09/12/18 15:10

## SAMPLE RESULTS - 04

L1027871

ONE LAB. NATIONWIDE.



## Radiochemistry by Method D3972

Analyte	Result pCi/l	Qualifier	Uncertainty + / -	MDA pCi/l	Analysis Date date / time	Batch
URANIUM-234	-0.362		0.351	0.3	10/08/2018 18:03	<a href="#">WG1172224</a>
URANIUM-235	0.0858		0.174	0.255	10/08/2018 18:03	<a href="#">WG1172224</a>
URANIUM-238	0.241		0.250	0.319	10/08/2018 18:03	<a href="#">WG1172224</a>
(T) URANIUM-232	73.9			30.0-110	10/08/2018 18:03	<a href="#">WG1172224</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## Radiochemistry by Method LANL ER200M

Analyte	Result pCi/l	Qualifier	Uncertainty + / -	MDA pCi/l	Analysis Date date / time	Batch
THORIUM-228	-0.161		0.148	0.262	09/28/2018 17:36	<a href="#">WG1170962</a>
THORIUM-230	-0.852		0.260	0.519	09/28/2018 17:36	<a href="#">WG1170962</a>
THORIUM-232	-0.234		0.0739	0.316	09/28/2018 17:36	<a href="#">WG1170962</a>
(T) THORIUM-229	78.0			30.0-110	09/28/2018 17:36	<a href="#">WG1170962</a>

MW-20

Collected date/time: 09/12/18 19:00

## SAMPLE RESULTS - 05

L1027871

## Radiochemistry by Method D3972

Analyte	Result pCi/l	Qualifier	Uncertainty + / -	MDA pCi/l	Analysis Date date / time	Batch
URANIUM-234	-0.0966		0.437	0.371	10/08/2018 18:03	<a href="#">WG1172224</a>
URANIUM-235	0.0880		0.177	0.259	10/08/2018 18:03	<a href="#">WG1172224</a>
URANIUM-238	0.923		0.421	0.226	10/08/2018 18:03	<a href="#">WG1172224</a>
(T) URANIUM-232	69.7			30.0-110	10/08/2018 18:03	<a href="#">WG1172224</a>

## Radiochemistry by Method LANL ER200M

Analyte	Result pCi/l	Qualifier	Uncertainty + / -	MDA pCi/l	Analysis Date date / time	Batch
THORIUM-228	-0.157		0.152	0.267	09/28/2018 17:36	<a href="#">WG1170962</a>
THORIUM-230	-0.724		0.283	0.527	09/28/2018 17:36	<a href="#">WG1170962</a>
THORIUM-232	-0.191		0.0952	0.322	09/28/2018 17:36	<a href="#">WG1170962</a>
(T) THORIUM-229	82.0			30.0-110	09/28/2018 17:36	<a href="#">WG1170962</a>

WG1167263

Radiochemistry by Method D3972

## QUALITY CONTROL SUMMARY

ONE LAB. NATIONWIDE.

L1027871-01

## Method Blank (MB)

(MB) R3345972-1 09/27/18 15:01

Analyte	MB Result pCi/l	MB Qualifier	MB MDA pCi/l
URANIUM-234	-0.220		0.0582
URANIUM-235	-0.0121		0.0508
URANIUM-238	0.0529		0.0508
(T) URANIUM-232	77.0		

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## L1021902-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1021902-01 09/27/18 15:01 • (DUP) R3345972-4 09/27/18 15:01

Analyte	Original Result pCi/l	DUP Result pCi/l	Dilution	DUP RPD %	DUP RER	DUP Qualifier	DUP RPD Limits %	DUP RER Limit pCi/l
URANIUM-234	11.2	9.91	1	11.8	0.627		20	3
URANIUM-235	0.702	0.0935	1	153	1.58		20	3
URANIUM-238	4.20	4.74	1	12.2	0.440		20	3
(T) URANIUM-232	77.2	75.8						

## Laboratory Control Sample (LCS)

(LCS) R3345972-2 09/27/18 15:01

Analyte	Spike Amount pCi/l	LCS Result pCi/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
URANIUM-234	25.2	24.0	95.3	80.0-120	
URANIUM-238	24.5	25.1	103	80.0-120	
(T) URANIUM-232			75.7		

## L1027871-01 Original Sample (OS) • Matrix Spike (MS)

(OS) L1027871-01 09/27/18 15:01 • (MS) R3345972-3 09/27/18 15:01

Analyte	Spike Amount pCi/l	Original Result pCi/l	MS Result pCi/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
URANIUM-234	101	6.05	107	99.6	1	75.0-125	
URANIUM-238	98.0	5.77	105	101	1	75.0-125	
(T) URANIUM-232		69.7		72.3			

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WG1172224

Radiochemistry by Method D3972

## QUALITY CONTROL SUMMARY

ONE LAB. NATIONWIDE.

[L1027871-02,03,04,05](#)

## Method Blank (MB)

(MB) R3349690-1 10/08/18 18:03

Analyte	MB Result pCi/l	MB Qualifier	MB MDA pCi/l
URANIUM-234	-0.145		0.0487
URANIUM-235	0.00910		0.0487
URANIUM-238	-0.00422		0.0557
(T) URANIUM-232	80.4		

<sup>1</sup> Cp<sup>2</sup> Tc<sup>3</sup> Ss<sup>4</sup> Cn<sup>5</sup> Sr<sup>6</sup> Qc<sup>7</sup> Gl<sup>8</sup> Al<sup>9</sup> Sc

## L1027871-05 Original Sample (OS) • Duplicate (DUP)

(OS) L1027871-05 10/08/18 18:03 • (DUP) R3349690-4 10/08/18 18:03

Analyte	Original Result pCi/l	DUP Result pCi/l	Dilution	DUP RPD %	DUP RER	DUP Qualifier	DUP RPD Limits %	DUP RER Limit pCi/l
URANIUM-234	-0.0966	-0.316	1	0.000	0.397		20	3
URANIUM-235	0.0880	-0.0212	1	200	0.519		20	3
URANIUM-238	0.923	0.956	1	3.51	0.0558		20	3
(T) URANIUM-232	69.7	79.1						

## Laboratory Control Sample (LCS)

(LCS) R3349690-2 10/08/18 18:03

Analyte	Spike Amount pCi/l	LCS Result pCi/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
URANIUM-234	25.2	26.6	105	80.0-120	
URANIUM-238	24.5	26.7	109	80.0-120	
(T) URANIUM-232			74.1		

## L1027871-04 Original Sample (OS) • Matrix Spike (MS)

(OS) L1027871-04 10/08/18 18:03 • (MS) R3349690-3 10/08/18 18:03

Analyte	Spike Amount pCi/l	Original Result pCi/l	MS Result pCi/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
URANIUM-234	101	-0.362	97.0	96.1	1	75.0-125	
URANIUM-238	98.0	0.241	101	103	1	75.0-125	
(T) URANIUM-232		73.9		77.2			

ACCOUNT:

Fansteel Wellman Dynamics - ORL

PROJECT:

SDG:

L1027871

DATE/TIME:

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WG1170962

Radiochemistry by Method LANL ER200M

## QUALITY CONTROL SUMMARY

ONE LAB. NATIONWIDE.

L1027871-01,02,03,04,05

## Method Blank (MB)

(MB) R3347548-1 09/28/18 17:36

Analyte	MB Result pCi/l	MB Qualifier	MB MDA pCi/l
THORIUM-228	-0.0463		0.0431
THORIUM-230	-0.0933		0.107
THORIUM-232	-0.0226		0.0633
(T) THORIUM-229	84.9		

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

## L1027871-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1027871-03 09/28/18 17:36 • (DUP) R3347548-4 09/28/18 17:36

Analyte	Original Result pCi/l	DUP Result pCi/l	Dilution	DUP RPD %	DUP RER	DUP Qualifier	DUP RPD Limits %	DUP RER Limit pCi/l
THORIUM-228	-0.129	-0.139	1	0.000	0.0537		20	3
THORIUM-230	-0.130	-0.874	1	0.000	1.97		20	3
THORIUM-232	-0.202	-0.131	1	0.000	0.606		20	3
(T) THORIUM-229	84.9	92.8						

6 Qc

7 Gl

8 Al

9 Sc

## Laboratory Control Sample (LCS)

(LCS) R3347548-2 09/28/18 17:36

Analyte	Spike Amount pCi/l	LCS Result pCi/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
THORIUM-228	2.00	1.92	96.2	80.0-120	
THORIUM-230	1.99	2.24	113	80.0-120	
THORIUM-232	2.00	2.03	102	80.0-120	
(T) THORIUM-229			91.2		

## L1027871-02 Original Sample (OS) • Matrix Spike (MS)

(OS) L1027871-02 09/28/18 17:36 • (MS) R3347548-3 09/28/18 17:36

Analyte	Spike Amount pCi/l	Original Result pCi/l	MS Result pCi/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
THORIUM-228	20.0	-0.268	17.7	88.6	1	75.0-125	
THORIUM-230	19.9	-0.841	20.3	102	1	75.0-125	
THORIUM-232	20.0	-0.157	18.9	94.3	1	75.0-125	
(T) THORIUM-229		104		86.1			





## Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

### Abbreviations and Definitions

MDA	Minimum Detectable Activity.
Rec.	Recovery.
RER	Replicate Error Ratio.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(T)	Tracer - A radioisotope of known concentration added to a solution of chemically equivalent radioisotopes at a known concentration to assist in monitoring the yield of the chemical separation.
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

### Qualifier Description

The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.



# ACCREDITATIONS & LOCATIONS

ONE LAB. NATIONWIDE.

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> GI

<sup>8</sup> AI

<sup>9</sup> Sc

Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
\* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1 6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1 4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T 104704245-17-14
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

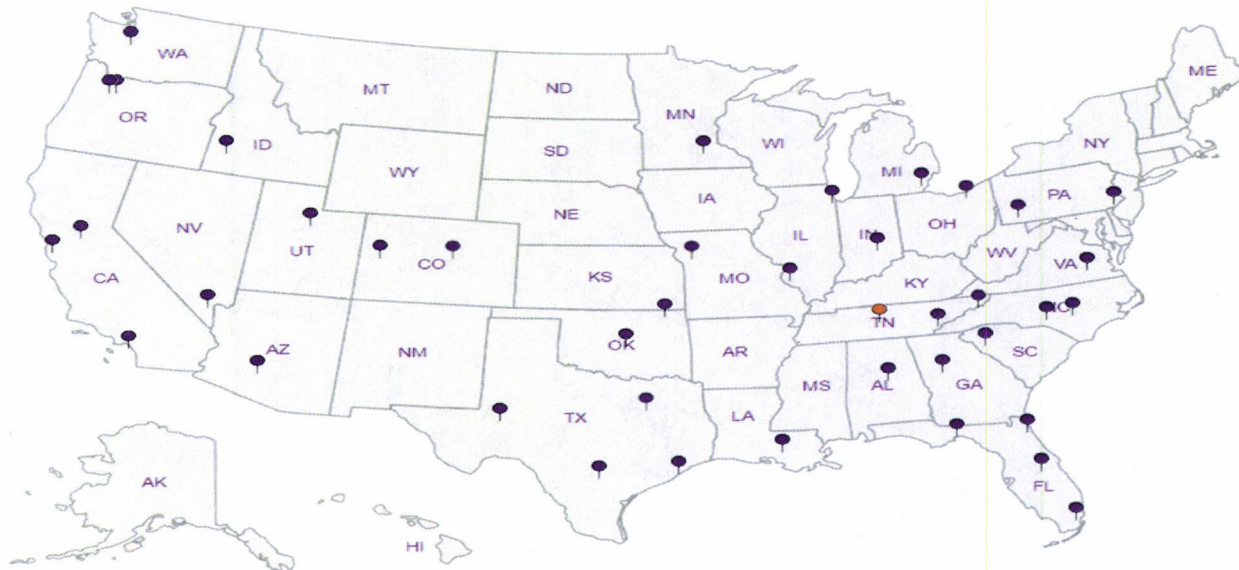
## Third Party Federal Accreditations

A2LA - ISO 17025	1461.01	AIHA-LAP, LLC EMLAP	100789
A2LA - ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



ACCOUNT:

Fansteel Wellman Dyamics - ORL

PROJECT:

SDG:

L1027871

DATE/TIME:

10/11/18 21:57

PAGE:

11 of 14



<b>Company Name: Fansteel Wellman Dynamics</b> Rich Vannucci / Matt Thelen 1745 Commerce Road Creston, IA 50801  641-782-8521 <a href="mailto:rvannucci@penn-er.com">rvannucci@penn-er.com</a>				<b>Company Name: Fansteel Wellman Dynamics</b> Contact Name: Matt Thelen 1745 Commerce Road Creston, IA 50801  641-782-8521 Bill to Email: <a href="mailto:matt.thelen@wellmandynamics.com">matt.thelen@wellmandynamics.com</a>				Analysis / Container / Preservative <div style="display: flex; justify-content: space-between;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">             ISO Uranium (U-ISO) 3 L HDPE unpreserved         </div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">             ISO Thorium (TH-ISO) 3 L HDPE unpreserved         </div> </div>								Chain of Custody Page ____ of ____  12065 Labanno Rd Mount Juliet, TN 37122 Phone: 615-758-5858 Phone: 800-787-5858 Fax: 615-758-5858 	
Project Name: <b>Fansteel - Creston</b>				Project Description: <b>Radiation sampling</b>													
City/State Collected: Creston, Iowa		Lab Project #		Site/Facility ID#													
Collected by (print): Randy Gavin / Tyler Merritt				P.O. # PA 4059													
Collected by (signature):		<b>Rush?</b> (Lab MUST Be Notified) Surcharges apply - call for pricing.		Date Results Needed													
Immediately Packed on Ice N _ X _ Y				Email? <input type="checkbox"/> No <input type="checkbox"/> Yes FAX? <input type="checkbox"/> No <input type="checkbox"/> Yes		No. of Cntr											
Sample ID	Comp/Grab	Matrix *	Depth	Date	Time												
MW-8	Grab	GW	---	9/11/2018	14:35	1	X	X									01
MW-11	Grab	GW	---	9/12/2018	17:05	1	X	X									02
MW-13	Grab	GW	---	9/13/2018	10:15	1	X	X									03
MW-19	Grab	GW	---	9/12/2018	15:10	1	X	X									04
MW-20	Grab	GW	---	9/12/2018	19:00	1	X	X									05

\* Matrix: SS - Soil GW - Groundwater WW - WasteWater DW - Drinking Water OT - Other \_\_\_\_\_

Comments: \_\_\_\_\_

pH \_\_\_\_\_ Temp \_\_\_\_\_

Flow \_\_\_\_\_ Other \_\_\_\_\_

Hold # \_\_\_\_\_

Relinquished by: (Signature) _____	Date: 9/19/18	Time: 10:00	Received by: (Signature) _____	Samples returned via: <input type="checkbox"/> UPS <input type="checkbox"/> FedEx <input type="checkbox"/> Courier <input type="checkbox"/> _____	Condition: (lab use only) <b>X RAD SCREEN</b>
Relinquished by: (Signature) _____	Date: _____	Time: _____	Received by: (Signature) _____	Temp: _____ °C Bottles Received: <b>5</b>	<b>PAK 13</b>
Relinquished by: (Signature) _____	Date: _____	Time: _____	Received for lab by: (Signature) _____	Date: <b>9/21/18</b> Time: <b>1055</b>	COC Seal Intact: <b>Y</b> N NA
				pH Checked: _____	NCP: <b>X</b>

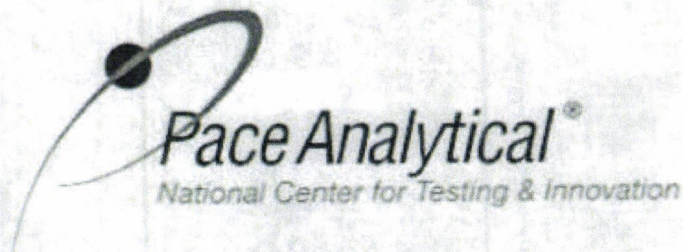


## Pace Analytical National Center for Testing & Innovation

### Cooler Receipt Form

Client: <u>FANWILL</u>	SDG#	<u>1027371</u>	
Cooler Received/Opened On: <u>09/21/18</u>	Temperature:	<u>40/16</u>	
Received By: Kelsey Stephenson			
Signature: <u>[Signature]</u>			
<b>Receipt Check List</b>			
	NP	Yes	No
COC Seal Present / Intact?		/	
COC Signed / Accurate?		/	
Bottles arrive intact?		/	
Correct bottles used?		/	
Sufficient volume sent?		/	
If Applicable			
VOA Zero headspace?			
Preservation Correct / Checked?			





Login #:1027871	Client: FANWELLORL	Date:9/21	Evaluated by:Kelsey
-----------------	--------------------	-----------	---------------------

**Non-Conformance (check applicable items)**

Sample Integrity	Chain of Custody Clarification	
Parameter(s) past holding time	x Login Clarification Needed	<b>If Broken Container:</b>
Improper temperature	Chain of custody is incomplete	Insufficient packing material around container
Improper container type	Please specify Metals requested.	Insufficient packing material inside cooler
Improper preservation	Please specify TCLP requested.	Improper handling by carrier (FedEx / UPS / Courier)
Insufficient sample volume.	Received additional samples not listed on coc.	Sample was frozen
Sample is biphasic.	Sample ids on containers do not match ids on coc	Container lid not intact
Vials received with headspace.	Trip Blank not received.	<b>If no Chain of Custody:</b>
Broken container	Client did not "X" analysis.	Received by:
Broken container:	Chain of Custody is missing	Date/Time:
Sufficient sample remains		Temp./Cont. Rec./pH:
		Carrier:
		Tracking#

**Login Comments: samples received unpreserved. Preserved in lab**

Client informed by:	Call	Email	Voice Mail	Date:	Time:
TSR Initials:DE	Client Contact:				

**Login Instructions:**

Preserve and analyze as usual

Notice: This communication and any attached files may contain privileged or other confidential information. If you have received this in error, please contact the sender immediately via reply email and immediately delete the message and any attachments without copying or disclosing the contents. Thank you.

**APPENDIX B**  
**GROUNDWATER EVALUATION**



## APPENDIX B

### GROUNDWATER EVALUATION

As noted in Item 1 of this compliance review report, Penn E&R has completed the annual evaluation of analytical results representing groundwater quality in the vicinity of the WDC facility. Controls for the former burial site on the property are specified in Section 10.0 of the WRSP. Annual groundwater monitoring and evaluation for radiological contamination are included in the list of controls.

Penn E&R has reviewed the available analytical data for radiological contaminants in groundwater at the subject site. Analytical data for select Monitoring Wells (MW)-8, MW-11, MW-13, MW-19, and MW-20 were made available by WDC for calendar years 1999 through 2018. Analytical data for MW-19 and MW-20 did not become available until 2001. MW-8 is considered an upgradient well for the sanitary landfill at the site, and MW-11 and MW-13 are considered to be downgradient. MW-19 is considered to be upgradient of the former burial site; MW-20 is considered to be downgradient. Analytical data for select groundwater samples collected in September 2018 are presented in **Table B1**.

To facilitate the evaluation, time-trend plots of the analytical data have been created and are attached to this narrative. The plots are evaluated against national drinking water standards or maximum contaminant levels (MCLs) for total alpha and total uranium concentrations. The total alpha MCL of 15 pCi/l is compared to the combined thorium concentration of the three (3) isotopes analyzed (Th-232, Th-230, and Th-228). The total uranium MCL of 20.1 pCi/l (estimated conversion from 30 µg/l) is compared to the combined uranium concentration of the three (3) uranium isotopes analyzed (U-238, U-235, and U-234). The time-trend plots are also reviewed for potential increasing or decreasing trends.

Thorium results indicate no identifiable trends for any of the wells with no combined thorium concentrations approaching the total alpha MCL of 15 pCi/l. The highest combined thorium concentration reported is 3.84 pCi/l in MW-20 for 2001. Thorium residuals are considered to be the primary radiological contaminants of concern potentially originating from the former burial site. Therefore, potential impacts to groundwater as referenced to drinking water standards have been negligible.

An evaluation of the combined uranium results indicates no identifiable trends for the select wells. It should be noted the total uranium concentration for MW-8 was elevated (11.95 pCi/l) in the sample taken in September 2018. MW-13 has also experienced uranium concentration spikes in the available record. In 2000, a spike of 24.98 pCi/l combined uranium concentration was noted (above the total uranium MCL of 20.1 pCi/l). Another spike of 27.57 pCi/l combined uranium concentration was observed in MW-13 in 2013. This concentration is also above the total uranium MCL of 20.1 pCi/l. The source of the elevated concentrations is unknown, since site operations have not involved uranium processing. Uranium is naturally occurring in sands, which have been used in site operations. Sand is also present naturally in the subsurface. Penn E&R proposes to continue evaluations of uranium concentrations at the site to identify any future uranium concentration spikes and possible trends.

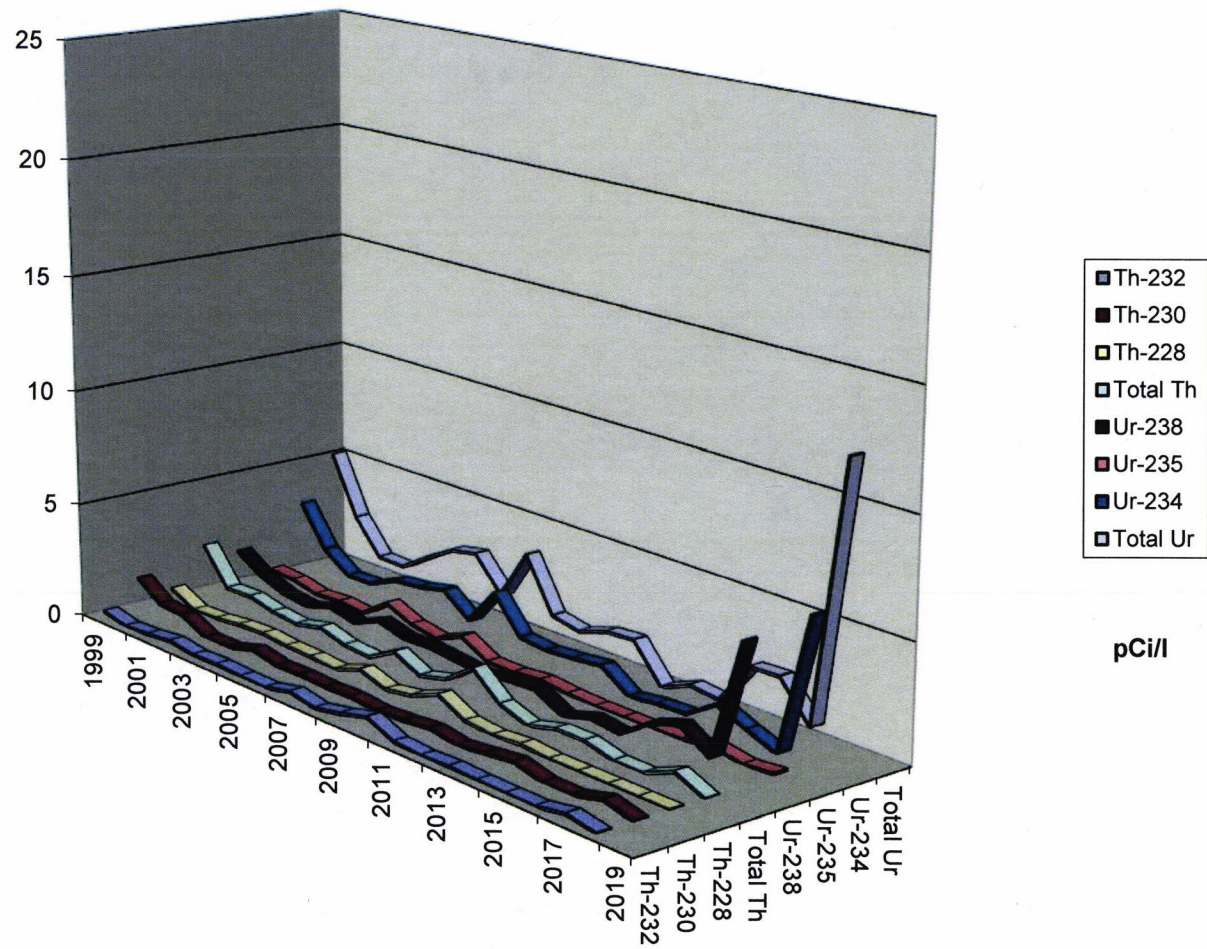
**Table B1**  
**Groundwater Sampling Radioactivity Results**  
**WDC Acquisition, LLC Facility**  
**Second Annual Inspection - 2018**

Parameter	Result (pCi/l)			Detection Limit (pCi/l)
MW-08				
Th-232	-0.246	+/-	0.076	0.314
Th-230	-0.923	+/-	0.244	0.507
Th-228	-0.303	+/-	0.100	0.253
U-238	5.770	+/-	1.030	0.222
U-235	0.128	+/-	0.198	0.254
U-234	6.050	+/-	1.160	0.377
MW-11				
Th-232	-0.157	+/-	0.099	0.250
Th-230	-0.841	+/-	0.221	0.414
Th-228	-0.268	+/-	0.115	0.224
U-238	0.645	+/-	0.354	0.283
U-235	0.215	+/-	0.225	0.240
U-234	0.221	+/-	0.456	0.209
MW-13				
Th-232	-0.202	+/-	0.085	0.300
Th-230	-0.130	+/-	0.336	0.494
Th-228	-0.129	+/-	0.151	0.251
U-238	0.963	+/-	0.404	0.225
U-235	-0.006	+/-	0.092	0.197
U-234	0.354	+/-	0.468	0.225
MW-19				
Th-232	-0.234	+/-	0.074	0.316
Th-230	-0.852	+/-	0.260	0.519
Th-228	-0.161	+/-	0.148	0.262
U-238	0.241	+/-	0.250	0.319
U-235	0.086	+/-	0.174	0.255
U-234	-0.362	+/-	0.351	0.300
MW-20				
Th-232	-0.191	+/-	0.095	0.322
Th-230	-0.724	+/-	0.283	0.527
Th-228	-0.157	+/-	0.152	0.267
U-238	0.923	+/-	0.421	0.226
U-235	0.088	+/-	0.177	0.259
U-234	-0.097	+/-	0.437	0.371

Note:  
Reference 10 CFR 20, Appendix B

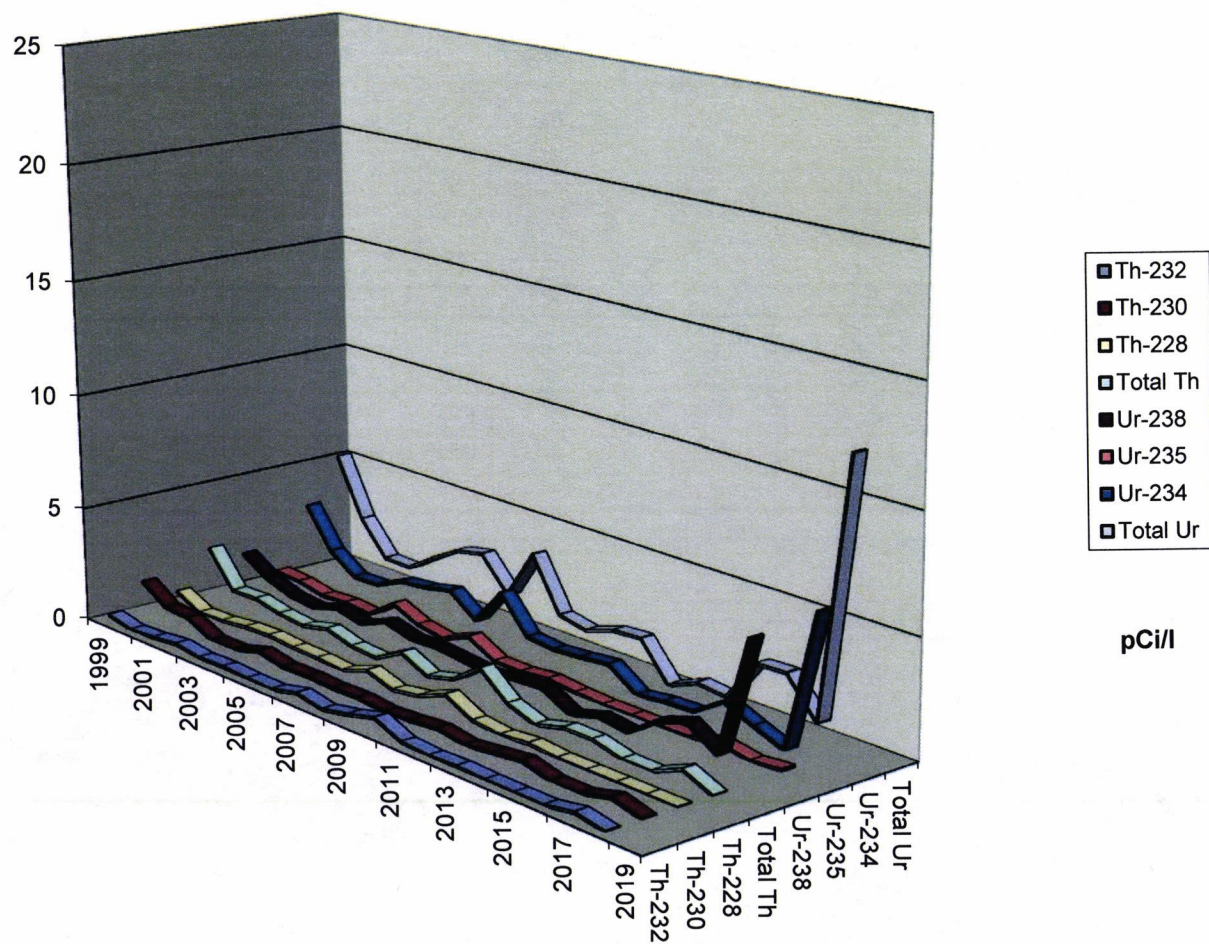


**MW-8  
WDC Acquisition, LLC  
Creston, Iowa**



Note: Total Alpha MCL = 15 pCi/l  
Total Uranium MCL = 20.1 pCi/l

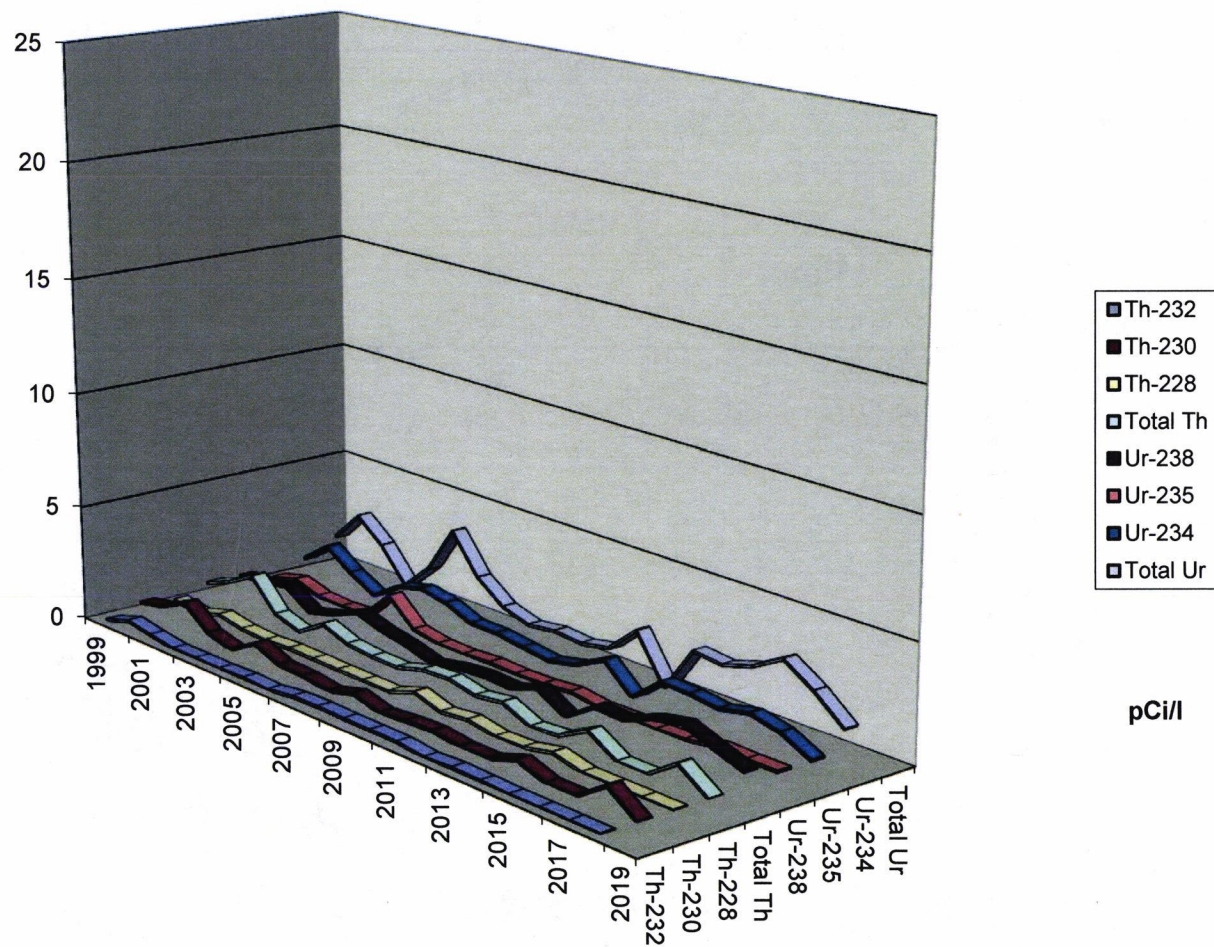
**MW-8**  
**WDC Acquisition, LLC**  
**Creston, Iowa**



Note: Total Alpha MCL = 15 pCi/l  
Total Uranium MCL = 20.1 pCi/l



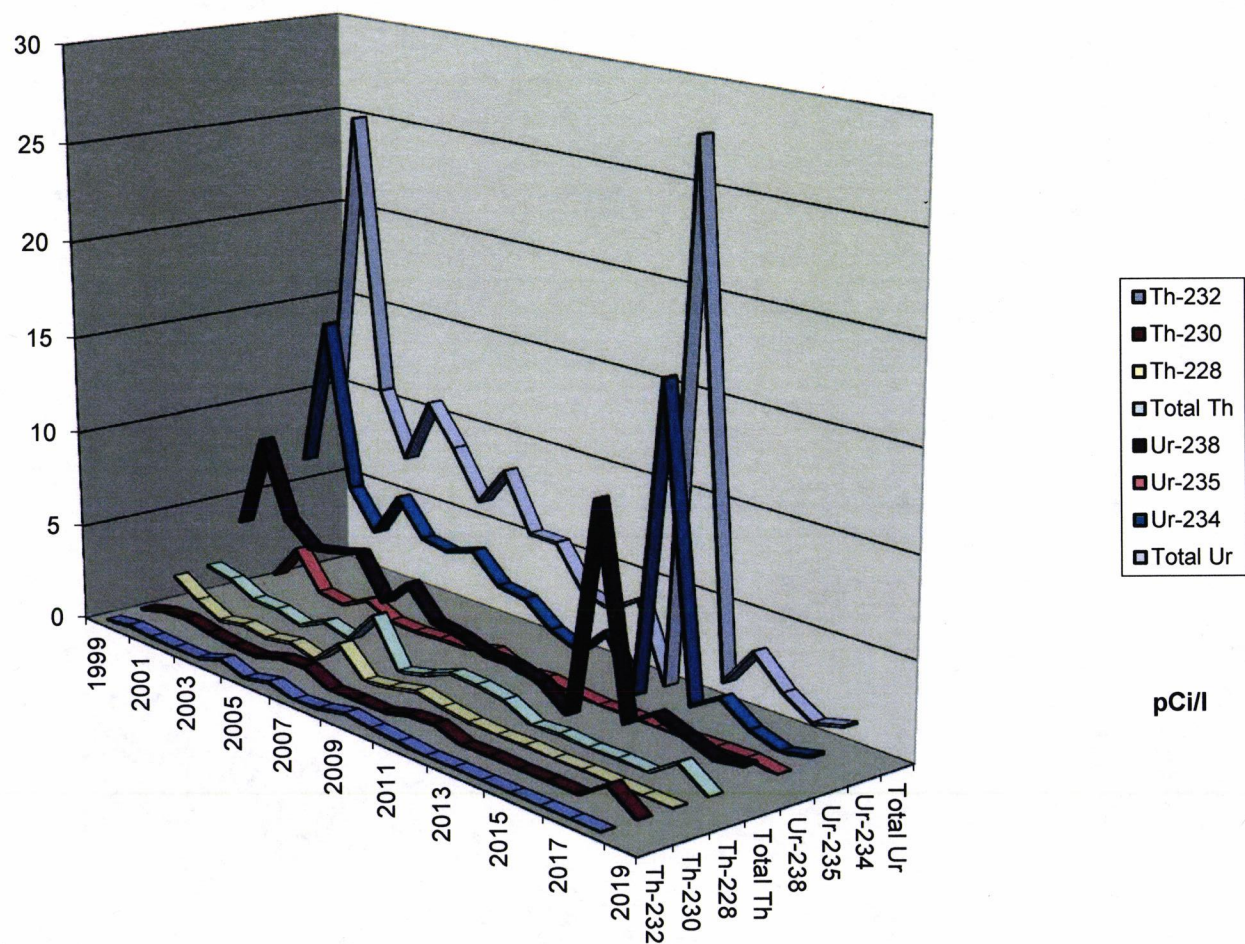
**MW-11  
WDC Acquisition, LLC  
Creston, Iowa**



Note: Total Alpha MCL = 15 pCi/l  
Total Uranium MCL = 20.1 pCi/l

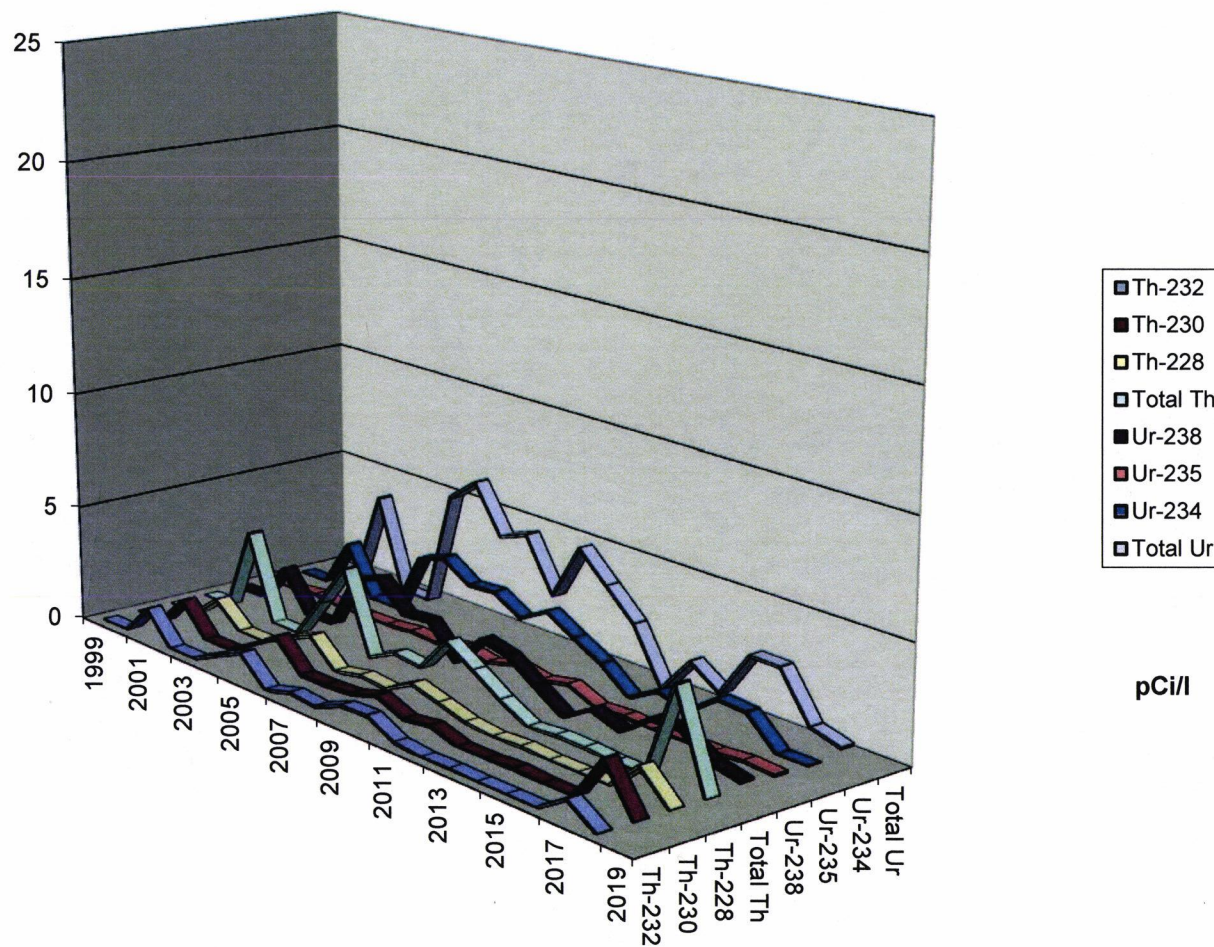


**MW-13  
WDC Acquisition, LLC  
Creston, Iowa**



Note: Total Alpha MCL = 15 pCi/l  
Total Uranium MCL = 20.1 pCi/l

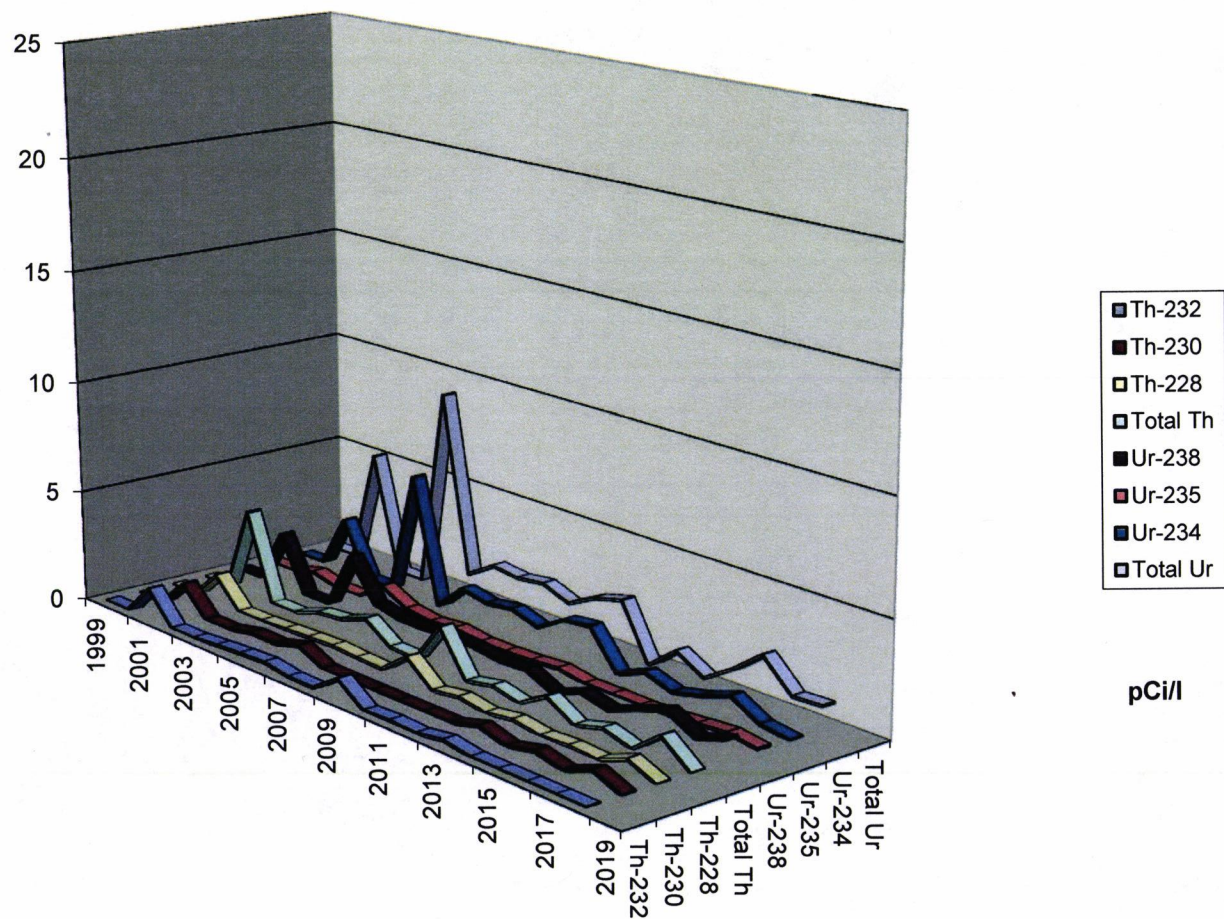
**MW-19**  
**WDC Acquisition, LLC**  
**Creston, Iowa**



Note: Total Alpha MCL = 15 pCi/l  
 Total Uranium MCL = 20.1 pCi/l



**MW-20**  
**WDC Acquisition, LLC**  
**Creston, Iowa**



pCi/l

Note: Total Alpha MCL = 15 pCi/l  
 Total Uranium MCL = 20.1 pCi/l